ELECTRICAL REVIEW

FRIDAY
20 MARCH 1959

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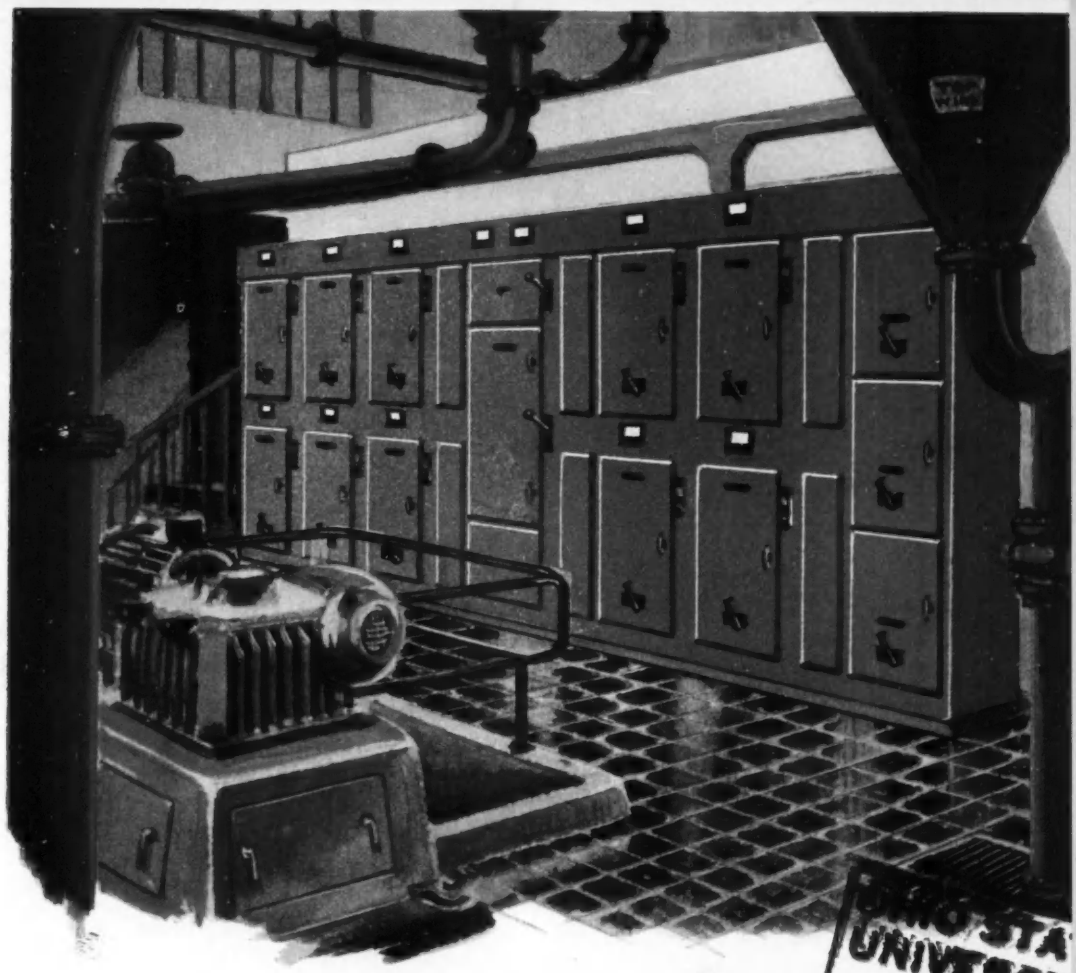

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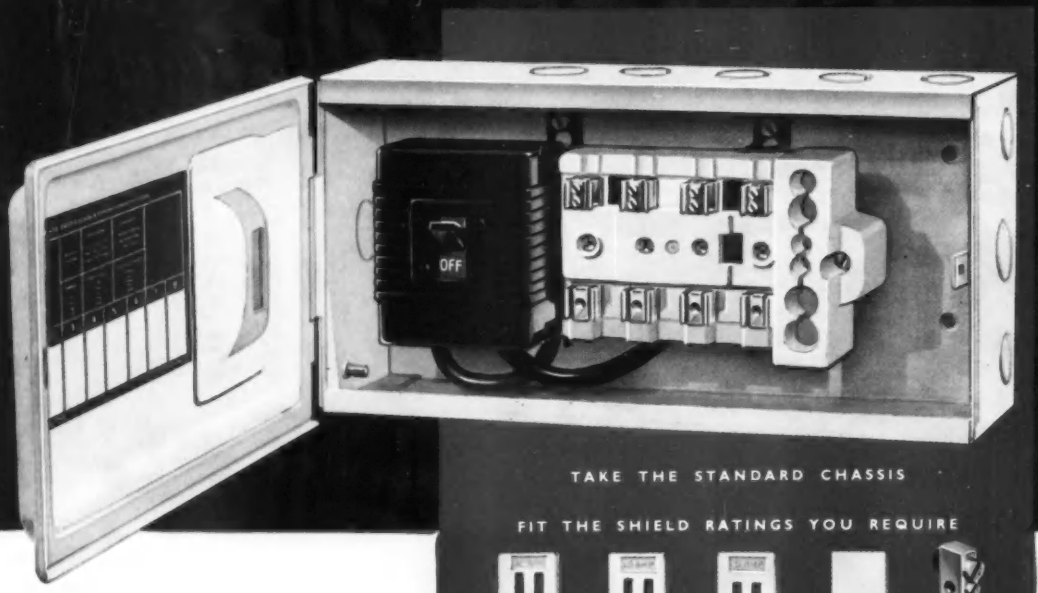

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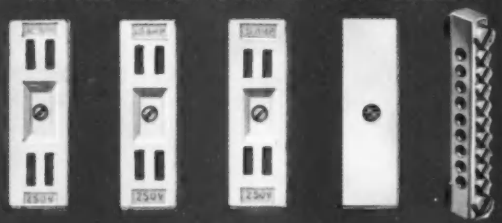

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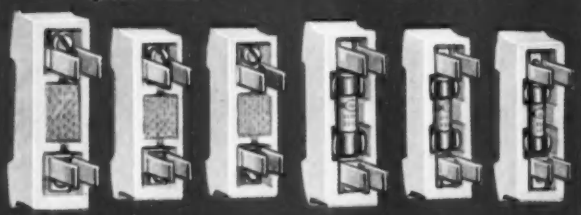

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MEM MIDLAND ELECTRIC MANUFACTURING CO. LTD · TYSELEY · BIRMINGHAM 11

ELECTRICAL REVIEW

20 March 1959 Vol. 164 No. 12 Established 1872

Leadership in the Industry

ELECTRICAL manufacture is a busy, prosperous and expanding industry, and it has suffered less than many industries from the difficult economic conditions of the past year. Though keener competition at home and abroad has resulted in lower profit margins, electrical manufacturers can in general look forward to a growing world demand for their products.

Their present unity and ability to withstand the pressure of economic forces owes much to the fact that they have had in the British Electrical and Allied Manufacturers' Association for the past fifty years a strong body which can exert a greater degree of influence in the solution of common problems than is possible by individual firms operating as discrete and unrelated units. Since the Association exists primarily to look after and promote the interests of its members, all its activities do not meet with universal approval, least of all from its customers. But even among the most severe of its critics there are probably few who would agree that the progress of the industry, and therefore of the country, would be assisted by a return to unbridled individualism.

The latest annual report of the B.E.A.M.A. Council covers an impressive, and apparently still growing, range of activities, and the discussion of matters that are not of exclusive interest to members of the Association occupied much of the time of the Council and of committees throughout the organisation. To take one example, the Council is quite rightly disturbed at the lack of appreciation by the Government, and others, of the electrical industry's contribution to the national economy. One result of this has been that financial measures have been applied without apparent concern for their effect on the industry's ability to export or on the economy of its operations in, say, the building of generating plant. By publishing yesterday the booklet " Serving the World " the Council has made it easier for the public to be informed of the industry's achievements.

Though this will do much good, we feel that an even greater understanding of the problems and views of manufacturers would be obtained, especially in official circles, if these were more fully set out in the annual report. The Council expresses itself forcibly on the harmful effects of the

operation of the Restrictive Trade Practices Act, but on many other subjects where one might expect guidance and leadership from the industry's major trade association, there is only a repetition of facts already well known. It is also disturbing that so little explanation is given of the slow progress made with two important projects—the Adequate Wiring Campaign and the National Approvals Scheme.

No doubt there are difficulties with the wide and divergent interests covered by the B.E.A.M.A. in getting agreement on a simple statement of policy. Changes now taking place in the internal structure of the Association, however, give hope that this problem will be overcome. The sections covering domestic appliances are already among the most enterprising and their grouping under a Divisional Board that includes some of the most distinguished names in that side of the industry is a wise move. The application of this arrangement to other sections would also appear to have advantages. Indeed, if the B.E.A.M.A. was to become a closely knit federation of relatively independent product divisions it would probably be a more dynamic force in the industry.

PROGRESS THROUGH EXPERIENCE

The concentration initially on a single type of reactor and the building of full-scale nuclear power stations before there was any question of their being strictly competitive have given this country the great advantage of early operating experience. The need to gain such practical experience on a commercial scale, which their own programme denies them, is one of the reasons for the special advantages offered by the United States to Euratom and other purchasers of their power reactors.

In the maritime field the positions are largely reversed. The United States already has two nuclear-powered submarines and the surface ship *Savannah* is expected to be at sea next year. Great Britain, on the other hand, appears to be waiting for an economic installation, and decisions on the type of reactor and on when and how a ship can be financed, built and operated have yet to be made. But, as is pointed out in the annual report of Lloyd's Register of Shipping, lack of actual operating experience of a reactor under maritime conditions may well handicap future commercial development. In their view, if progress is to be made, a decision must be taken on the basis of present knowledge and experience of land based reactors. In this way a start could be made in building up experience, even though the reactor is not yet economically attractive.

SOUTH SCOTLAND ACTIVITIES

During the last twelve months we have laid special stress on the need for more practical training facilities for student and graduate apprentices. The Institution of Electrical Engineers held a conference on the subject last November and one of the speakers gave an account of the Scottish Electrical Training Scheme (S.E.T.S.) which is sponsored by a group of small firms and the two supply authorities. It is pleasing to note that the annual report of the South of Scotland Electricity Board for 1958, summarised in this issue, makes a special point of this scheme and it is hoped that the S.E.T.S. will form a model for many future group training schemes.

The Board's annual report also contains the report of the Electricity Consultative Council for the South of Scotland District. An interesting item concerns an industrial customer's plea for a special tariff. This consumer contended that, as his demand was high in the summer and low in the winter, he should receive sympathetic consideration for a price reduction. The Council was unable to accept this, since the annual overhauling of generating plant takes place during the summer. The S.S.E.B. has, however, been particularly successful in its campaign to promote off-peak load development. In fact, it is estimated that in 1958 off-peak development improved the system load factor from 44·6 to 45·8 per cent.

HOUSING STANDARDS

We reported in our 27th February issue (page 403) that the Building (Scotland) Bill now before Parliament contains a clause under which those responsible for electrical installations in all future buildings in Scotland will be required to certify that the installations comply with specified conditions.

Now the Central Housing Advisory Committee, of which the Minister of Housing and Local Government is chairman, has set up a committee " to consider the standards of design and equipment applicable to family dwellings and other forms of residential accommodation, whether provided by public authorities or by private enterprise and to make recommendations." None of the members of this sub-committee appears to have any electrical connection but it is to be hoped that, with the Scottish example in mind, the sub-committee will include electrical installations in its studies. To make sure that it does, those concerned in seeing that electrical installations are adequate and sound should write to the secretary of the sub-committee, Mr. S. W. Gilbert, at the Ministry of Housing and Local Government, Whitehall, London, S.W.1.

AMERICAN SETBACK

The recession which the United States experienced last year is reflected in a survey by the *Electrical World* (New York) of electricity supply and electrical production during 1958. It is noteworthy that while industrial supplies of electricity, which accounted for 48·3 per cent of the output, were 2·6 per cent lower than in 1957, " residential " supplies (27·9 per cent of the total) rose by 8·1 per cent and " small light and power " (17·8 per cent) by 6·4 per cent. The total sales went up by 2·1 per cent. Practically all branches of the American manufacturing industry reported a decline in production. Based on an index figure of 100 for 1947-49, there was a fall from 210·4 in 1957 to 189·2 in 1958 in the total value of electrical products ($19,465 million) for the second year in succession. This decrease was general, although small in the case of illuminating equipment. Signalling and communication equipment remained at the 1957 level. In spite of the higher sales of residential electricity domestic appliance sales showed a fairly sharp fall.

By
C. C. H. WASHTELL, M.Brit.I.R.E.

Electronic Counting Techniques

APPLICATIONS TO TIMING TRANSIENT EFFECTS AND LAGS

The accurate measurement of short time intervals such as those associated with the operating times of electromagnetic devices used in safety circuits or the duration of current/voltage transients, is of considerable importance to the power transmission engineer

IN the absence of suitable means for carrying out the measurement of short time intervals in a simple manner with a high degree of accuracy, this aspect of routine testing has in the past been treated in a somewhat arbitrary fashion on what one may well call a "hit and miss" basis, but the development of high-speed electronic techniques has now revolutionised such measurements.

One of the simplest forms of counting techniques applicable to the measurement of the operating times of small relays with change-over contacts is shown diagrammatically in Fig. 1. This apparatus will allow a relay under test to operate the time counter directly and measure its operation time within the range 1-9 milliseconds. Its operation is as follows:—

The single Dekatron counter tube employed is arranged to be manually reset to digit 9. The binary flip-flop which follows the counter is triggered by a pulse derived from the subsequent investment of the Dekatron glow-discharge at its zero cathode when the "read" switch is closed and the first of the 1 kc/s timing waveform pulses arrives on the Dekatron guide electrodes. The resultant flip-over of the binary causes the cathode-follower stage, which carries the relay under test as its cathode load, to conduct heavily and energises the coil of the relay with negligible overall time delay. As the 1 kc/s timing waveform is routed to the counter tube via the normally-closed contacts of the relay, instantaneous operation of the relay would result in the signals to the counter being cut off immediately and the registration of zero time. The inevitable time lag of the relay operation, however, allows a discrete number of pulses to pass into the counter and thus discloses the operating time to the nearest millisecond.

Where the operation of the normally-open contacts is to be observed, the 1 kc/s signal is routed directly to the "read" switch and these contacts are arranged to short circuit the timing waveform when the relay operation is terminated. De-energising times can also be measured if the cathode follower is connected to the opposite leg of the binary flip-flop, so that the relay coil is energised when the instrument is initially reset to digit 9. The coil is de-energised upon the arrival of the first timing signal when the "read" switch is closed—reversing the switching techniques described above for normally-open and normally-closed contacts.

Clearly, this method is only suitable for bench testing those relays whose coil consumption can be accommodated by the space current of electronic valves and is accurate only to the nearest millisecond over a limited range of operating times. The range may be readily extended by the addition of further decades and the accuracy improved by increasing the time source frequency and the counting speed of the display. A counter chronograph type of instrument incorporating these features, whose gate may be operated by pulses derived from the mechanism under test (as distinct from utilising

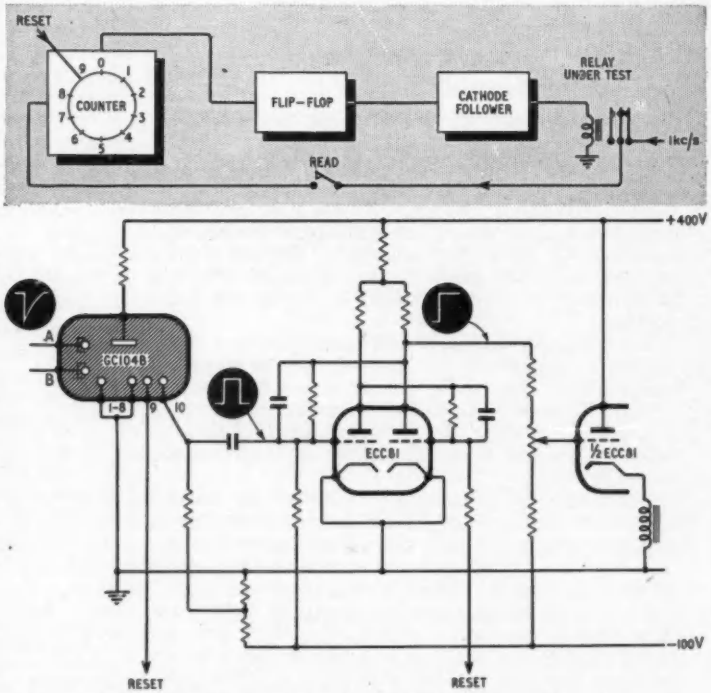


Fig. 1.—The apparatus represented diagrammatically will allow a relay under test to operate the time counter directly and measure its operation time within the range 1 to 9 milliseconds

the relay as the physical switching device for the time pulses), is usually preferred for general work in this field. Fig. 2 illustrates a typical commercial instrument designed for use in the range 10 to 10^{-4} sec, known as a "Time-period Counter."

The basic principle employed is illustrated in Fig. 3. There are three main functions involved, i.e. (1) the production of a train of equi-spaced pulses representing a decimal division of unit time; (2) a decade counter to count and divide down these pulses; and (3) a gate or switch of negligible resolving time interposed between 1 and 2.

In operation, at the "ready" condition, the gate is closed and the counter reset—displaying a zero indication. At the instant of applying the current front to the coil of

Fig. 2.—Typical commercial instrument (Time-period Counter) designed for use in the range 10 to 10^{-4} seconds

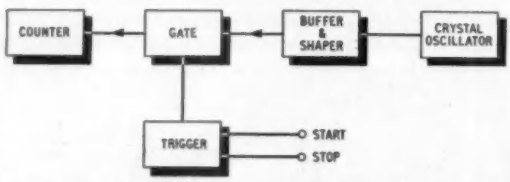


Fig. 3.—Basic principle of Time-period Counter depicted in Fig. 2

the relay under test, the gate is opened and the counter commences to register the time pulses as they arrive. Upon the subsequent magnetic initiation of the mechanical movement and the closing (or opening) of the electrical contacts on the relay, the gate is closed. The time interval between these two events is thus displayed from the memory store of the counter until it is wiped out by the operator.

The source of time pulses takes the form of a stable sine-wave oscillator of the zero temperature coefficient quartz crystal type having a fundamental frequency of 10^4 c/s. This oscillator runs continuously and its output is amplified and shaped by buffer and squaring stages to produce a train of pulses suitable for application to the electronic counter.

The counter is an electronic version of the classical mechanical counter giving decimal division of the driving impulses, but having a resolution time considerably better than the time interval between successive time source pulses to be counted. When counting ceases the state-of-count is displayed in a suitable manner in digital form using decimal notation, e.g. 0·0123 sec. As the accuracy of measurement for this class of work need not normally be better than "to the nearest tenth of a millisecond," the counter may again with advantage be of the cold-cathode glow-transfer type employing Dekatrons, as these counting tubes combine in the simplest form both a memory of the state-of-count and a visual display, and can operate at speeds which readily permit a resolution of pulses 100 microseconds apart.

The electronic gate is essentially a high-speed switch operating in but a few microseconds. The error that this delay introduces into the measurement can be ignored, for quite apart from its small magnitude, the extension of the true time interval, due to its intrusion into the measurement, is the difference between the opening and closing time of the gate and this time period may be a thousand times smaller than the interval between successive pulses in the time source train.

The application of such a counter chronograph to the measurement of the operating times of the wide variety of electromagnetically controlled switchgear used in the electrical industry is plainly one of suiting the gating control arrangements to the numerous combinations and permutations of electrical and mechanical signals that will be available to operate the instrument. Clearly, one of the prime requirements of a gating control circuit is that it will open instantaneously and close in like manner and be unaffected by spurious signals inadvertently introduced by the production of control signals. This means that not only must the gate be opened, but it must be "latched" in the open condition, then "unlatched," closed and latched again at the completion of the task, in order to retain the information gained without any possibility of change due to subsequent events.

To achieve these desiderata, in the instrument illustrated, the gate is designed around a pentode valve having sharp cut-off suppressor-grid characteristics, with gas-tube holding circuits to assist the triggering and latching action. A change in d.c. level of 24 V applied to the suppressor grid thus suffices to actuate the gating tube and by suitable internal biasing arrangements either mechanical contacts or external voltage pulses can provide correct conditions for the operation of the gate.

In its standard form, the Time-period Counter is equipped with three insulated terminals to accommodate the use of mechanical contacts and two coaxial sockets to receive pulses. These terminations use different methods of control so that it is possible to accurately measure the time interval between two events signalled in the following manner:—

Mechanical contacts:

(1) Open-circuit "start" followed by short-circuit "stop";

(2) Short-circuit "start" followed by open-circuit "stop."

Pulses:

(3) Positive-going waveform at "start" socket followed by a similar signal, emanating from a separate source, applied to the "stop" socket;

(4) Two similar voltage pulses following each other, both applied to the "start" socket.

It will be seen that these arrangements cover the operation of the counter from two independent pulse sources or, alternatively, from two pulses derived from a common source as well as from the opening and closing of switch contacts. The use of the "start" socket for

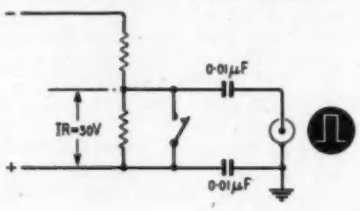


Fig. 4.—Where combinations of mechanical contacts and pulses are used it is better to convert the contact closures to pulses

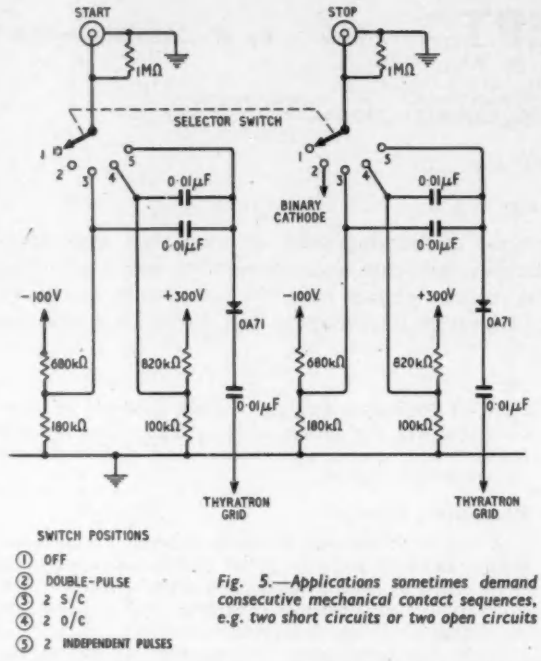


Fig. 5.—Applications sometimes demand consecutive mechanical contact sequences, e.g. two short circuits or two open circuits

both start and stop pulses involves the incorporation of a binary circuit element associated with the start socket which will initiate the stop circuits from the second signal applied to the start socket and is a most useful adjunct to the gating system. Waveforms of 24 V minimum peak are required to operate the gas tube triggering and holding circuits controlling the electronic gate and these may be obtained directly from the switchgear action via suitable resistance-capacity networks for a.c. coupling to the instrument sockets. Measurements may thus be made upon electromagnetic switchgear under working conditions if normal safety precautions are observed. This is important, since protection gear by its very nature stands inoperative for lengthy periods in the absence of emergency conditions, and is often subjected to varying conditions of temperature and humidity, and its mechanical characteristics are consequently liable to change and long-term deterioration. It is therefore not merely a question only of the checking of the operating characteristics of such equipment upon installation, but their routine examination and maintenance in correct and specified order of efficiency—calling for measurements *in situ*—which often represents a problem.

Where combinations of mechanical contacts and pulses are to be employed as signals, it is preferable to convert the contact closures to pulses in the manner shown in Fig. 4 and apply the resultant waveform to the appropriate pulse socket to give a common method of initiation.

Applications are occasionally envisaged which demand the use of consecutive mechanical contact sequences of similar kind, i.e. two short circuits or two open circuits following each other. The mechanical contact facilities brought out in the standard instrument will not accommodate these, but they can readily be obtained by simple circuit modifications. Fig. 5 shows the manner in which this has been carried out at the request of the C.E.G.B. to permit these requirements to be met by direct connection to the pulse sockets, and has been included to indicate the versatility of the gating system.

Certain other applications involve the operation time measurement of devices connected in tandem, where a number of event sequences must be examined simultaneously or perhaps immediately following each other without intervening time for observation of the results. In these cases a plurality of Time-period Counters may be employed together, the termination of count in one channel being arranged to initiate the count in a second channel. In such circumstances it is recommended that the counters are driven from a single source of time pulses to ensure a common accuracy of result. Installations involving up to 12 channels have been successfully employed in this manner, it being customary to add one additional channel to summate and check the individual readings of the tandem-connected channels.

The timing of transient effects in which the mean level of voltage is exceeded in a random fashion may also be attempted with a counter chronograph type of instrument. A practical method of approach to this task is to employ a discriminator circuit between the line to be monitored and the counter. The function of the discriminator is to reduce to a uniform amplitude all waveforms applied to it which are in excess of a desired minimum value and the device usually consists essentially of a modified Higginbotham circuit with adjustable input triggering level. Where the amplitude of the transient is small, i.e. does not fall within the range 5 to 50 V, which is normal for this type of circuit, it will be necessary first to amplify the effect, or otherwise modify it to suit the window of the discriminator. The resultant signal passed to the counter can then be made to have the form of a square wave of controlled rise time and a width equal to the period of time over which the amplitude of the phenomenon exceeds a chosen level. This waveform can be applied directly to the suppressor grid of the pentode gating tube of the Time-period Counter and is thus superposed upon the gating tube cut-off bias and will open the gate on its positive-going edge and close it again on its negative-going fall.

As the duration of such transients is sometimes very short, whilst still involving considerable amplitudes, it may be necessary to measure their duration with microsecond accuracy. This will demand the use of more elaborate counting equipment than that described, of a type incorporating hard valve or transistor scaling circuits in conjunction with a crystal oscillator time-source frequency of the order of 10^6 or perhaps 10^7 c/s. A typical commercial instrument of this kind will measure short duration transient effects to an accuracy of plus or minus one microsecond.

In this brief description of counting techniques applied to timing transient effects and lags, it has been possible only to outline the general procedure, but it should be apparent that given a high-speed gated counter and an accurate source of time pulses, the performance of almost any type of switchgear can be assessed once a practical method of operating the gate by the work under examination has been evolved. Whilst this may sometimes call for specialised treatment, the majority of tasks so far encountered in the electrical industry have been satisfactorily solved by the use of one or other of the techniques described.

Industrial Art Bursaries

The report of the Royal Society of Arts on its industrial art bursaries competition for 1958 states that 495 candidates from 80 schools and industrial establishments entered the various sections of the competition as compared with 423 and 70 respectively in 1957. A total of 25 bursaries amounting in value to £3,300 were awarded.

RING MAIN CONCEPT

By W. CASSON, M.I.E.E.*

Comparison of the Economic, Technical and Constructional Aspects with other Systems of Connection

The advantages and disadvantages of the ring main as compared with alternative supply arrangements in houses, factories, and transmission and distribution systems are discussed and the article shows how the ring main has been modified from its original form for use in transmission and distribution systems

THE ring main is a concept which has been applied to the wiring systems of houses and factories and transmission and distribution systems. The Ministry of Works has issued some Technical Notes (No. 4) which deal with the importance of the ring main in the house. The basic idea is that if a connection, used for providing supplies of electricity to a load, is rearranged and extended so that supplies are fed from both ends to the load, both technical and economic advantages should accrue. No doubt the idea originated from the days when consumers were supplied by single radial feeders and, when reinforcement was required, it was found expedient to interconnect the receiving points rather than duplicate the radial feeders.

The ring main concept appears to have been introduced on a large scale in the wiring of houses and factories during the last ten years and it is claimed that for an estate of 150 houses a saving of about £300 can be made compared with the normal radial system. This is partly because the ring main system lends itself well to the use of prefabricated wiring.

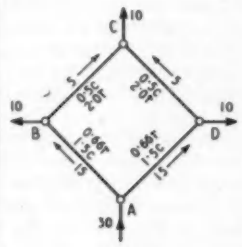
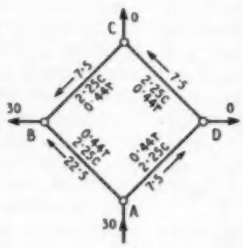
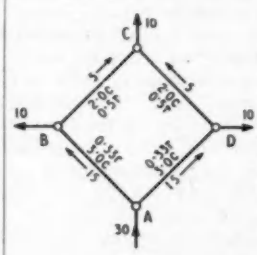
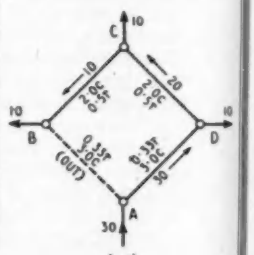
Economic Aspects

A simple comparison is made between a ring main system and an equivalent radial system supplying loads at B, C and D from a source A in Figs. 1 and 2. It is assumed that the distances A-B, B-C, C-D and D-A are each equal to "l" and A-C equal to $\sqrt{2}l$.

In the first comparison, between Figs. 1a and 2a, the circuits are designed exactly to carry the load, the current taken by the loads at B, C and D respectively being ten units. It is computed that the cost of the ring main

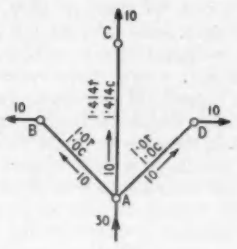
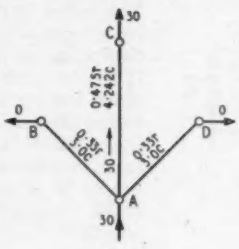
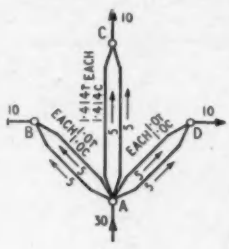
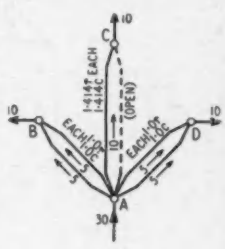
* C.E.G.B. Transmission Design Engineer.

FIG. 1.—RING MAIN SYSTEM

	(a) Circuit capacity equal to load flowing	(b) Circuit capacity uniform: whole load taken at B	(c) Circuit capacity equal to highest load flow with one circuit out	
			(i) Ring closed	(ii) A-B open
				
	(a)	(b)	(c1)	(cii)
Cost in conductor and insulation ...	4c	9c	10c (12c if made uniform) =3c per circuit	
Resistance of conductor—				
A-B or A-D ...	0·66r	0·44r	0·33r	
B-C or C-D ...	2r	0·44r	0·5r	
Copper losses ...	$2\times15^2(0{\cdot}66r)+2\times5^2(2r)$ =400r	$22{\cdot}5^2(0{\cdot}44r)+3\times7{\cdot}5^2(0{\cdot}44r)$ =296r	$2\times15^2(0{\cdot}33r)+2\times5^2(0{\cdot}5r)$ =250r	$30^2(0{\cdot}33r)+20^2(0{\cdot}5r)+10^2(0{\cdot}5$ =550r
Reactive volt drop—				
A-B	10x	10x	5x	10x+10x+5x=25x
A-C	10x+10x=20x	—	5x+2·5x=7·5x	10x+10x=20x
A-D	10x+10x=20x	—	5x	10x

Assume: unit conductor of length="l" of current carrying capacity=10 units
cost of unit length="c"
resistance of unit length="r"
reactance varies same as resistance
unity p.f. loads.

FIG. 2.—RADIAL SYSTEM

	(a) Circuit capacity equal to load flowing	(b) Circuit capacity uniform: whole load taken at C	(c) Circuit capacity equal to highest load flow with one circuit out	
			(i) All circuits in	(ii) One circuit A-C open
				
	(a)	(b)	(ci)	(cii)
Cost in conductor and insulation ...	3·414c	10·242c	6·828c	
Resis. of conductor—				
A-B	r	0·33r	0·5r	0·5r
A-C	1·414r	0·475r	0·707r	1·414r
A-D	r	0·33r	0·5r	0·5r
Copper losses ...	$2\times10^2(r)+10^2(1\cdot414r)$ $=341\cdot4r$	$30^2(0\cdot475r)$ $=427\cdot5r$	$2\times10^2(0\cdot5r)+10^2(0\cdot707r)$ $=171r$	$2\times10^2(0\cdot5r)+$ $10^2(1\cdot414r)=241r$
Reactive volt drop—				
A-B	10x	—	$10\times\frac{x}{2}=5x$	$10\times\frac{x}{2}=5x$
A-C	$10\times1\cdot414x=14\cdot14x$	$30\times\frac{x}{3}=10x$	$10\times\frac{1\cdot414x}{2}=7\cdot07x$	$10\times1\cdot414x=14\cdot14x$
A-D	10x	—	$10\times\frac{x}{2}=5x$	$10\times\frac{x}{2}=5x$

Assumptions as in Fig. 1

system in conductor and insulation is four units which, compared with the cost of the radial system of 3·414 units, is 17 per cent greater, also the losses are correspondingly greater. Thus, the ring main system is not as economic as the radial system in this case.

For the second study the ring main system is of uniform capacity and both systems are designed to permit a load of 30 units to be taken at any one point. Comparing Figs. 1b and 2b, it is seen that to provide this facility the ring main system has to be increased in capacity so that the cost in conductor and insulation becomes 2·25 times that of the system in Fig. 1a, and the radial system cost becomes three times that of the system in Fig. 2a. Thus, for installations where the facility is required of connecting the whole of the load at any one point, such as house wiring, or where account can be taken of diversity of load, the ring main system could prove to be more economic in conductor and insulation than an equivalent radial system. A typical ring main system for an average-sized house would have a uniform wiring capacity of 20 A and a plugboard at each load point for connecting a 10-13 A fire or other large appliance, plus a 2 A and 5 A plugs for a standard lamp or other small appliance. A total load (excluding cooker and general lighting) of 30 A could be supplied comfortably from such an installation.

The two systems in Figs. 1a and 2a are modified for the third study to become the systems in Figs. 1c and 2c which are designed to allow a section of line to be taken out of commission either for maintenance or on account of a fault, and the load supplied from the remaining section or sections. To meet this requirement the ring main system has to be increased in aggregate capacity to 2·5 times that of the system in Fig. 1a, and if made uniform in capacity with that of the heaviest loaded section, i.e. to carry 30 units of load, it has to be increased three times. The radial system will require duplicate feeders to each point so that its total capacity, compared with that of the system in Fig. 2a, is doubled. In Figs. 1c and 2c, the losses are given and it is seen that the radial system is much more economic in losses as well as in conductor and insulation than the ring main system supplied from one source. However, for transmission and distribution systems, in addition to the cost of conductor and insulation, account must be taken of the switchgear to be provided in each case. The radial system requires, as the minimum, two h.v. circuit-breakers per line, these being installed at the sending end A, making a total of six. If transformers are connected at the remote ends B, C and D, six l.v. breakers would also be required. The equivalent ring main system will require, as the minimum, two h.v. circuit-breakers at the sending end and a section h.v. breaker at each load point, making a total of five. The number of l.v. breakers for the transformers will be six, so that the net result is a saving of one h.v. circuit-breaker for the ring main system.

To reinforce the systems in Figs. 1c and 2c, the ring main system could be duplicated as in Fig. 3a; this would double the firm capacity at an increase in cost of conductor and insulation of 100 per cent, the transformers being replaced by larger units. Alternatively, the capacity of the ring main could be doubled as shown in Fig. 3b by providing two new circuits from A to C, each equal in capacity to the circuits from A to B or from A to D. This would involve an increase in cost of 84·4 per cent in conductor and insulation and 60 per cent in switchgear. A method of trebling the capacity of the ring is shown in Fig. 2c, in which three new circuits are provided from A to B, C and D at an additional cost of 88 per cent on conductor and insulation and 120 per cent on switchgear.

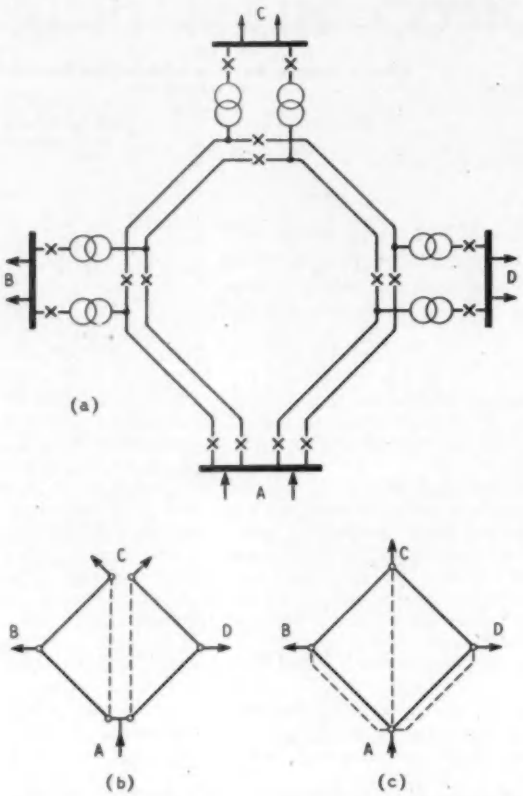


Fig. 3.—Ring main reinforcement. (a) Duplicated ring main. (b) Reinforcement by splitting the ring. (c) Reinforcement by radial feeders

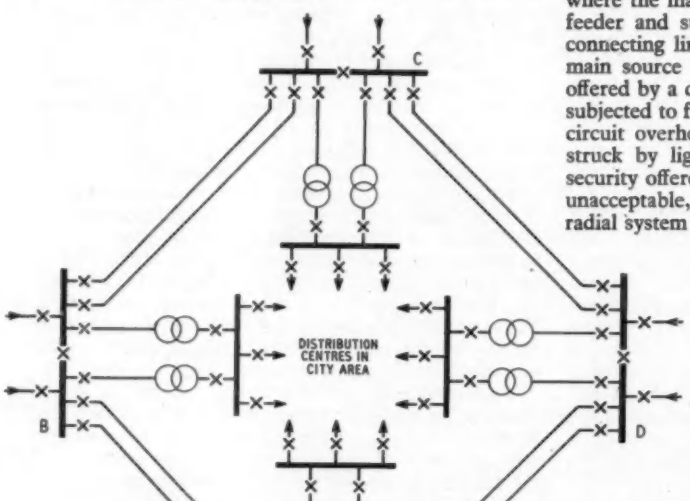


Fig. 4.—Large city ring main

So far comparisons have been made between ring main and radial systems fed from one source only. Consideration will now be given to systems supplied from several points. A densely loaded area such as a large city and its environs can be divided up into areas for distribution, each supplied in bulk from sources outside the area by means of radial feeders. These feeders may have to be provided wholly of cable or of cable plus overhead line. The radial feeders may be short or long and they may come from several directions or from one direction only, depending on the positions of the sources of generation. It has been found that a ring main system from which radial feeders are tapped off to supply the load centres within the area, and in which the feeders from the source of generation outside the area are connected into the ring main at suitable points, is a very economic method of supply as it affords interconnection from one point to another to pool the sources of generation and gives high security. Such a scheme is shown in Fig. 4 and is being employed around London, Birmingham and the north-east coast area in this country. It is also being employed around such foreign cities as Paris and Oslo. The ring main may take the form of a wholly cable installation as in Oslo, or wholly overhead line installation as proposed in England and France.

Technical Aspects

Security of Supply.—Security is a vital factor in considering arrangements of circuits to provide a supply. In the case of a house wiring installation a fault on the ring main means a shut-down of supplies from that ring main until the fault is repaired. The usual minimum requirements for transmission and distribution systems for supplies exceeding 15 MW are that circuits and transformers are duplicated so that one unit can be taken out of circuit for maintenance work or upon operation of the protection system when a fault occurs on one circuit or transformer. Alternatively, the requirements are met where the main source of supply is provided by a single feeder and sufficient capacity is provided in the interconnecting links with other points of supply to allow the main source to be taken out of service. The security offered by a duplicate supply fails when both circuits are subjected to fault simultaneously, such as when a double-circuit overhead line is employed and both circuits are struck by lightning. For very important supplies the security offered by a double-circuit overhead line may be unacceptable, so that this would be a disadvantage in a radial system of two circuits using this form of construction. To give the security which is necessary, a further single-circuit line would be the minimum requirement for security. With the duplicated ring main system shown in Fig. 3a, the supplies would not be affected by a double-circuit outage except that there would be a slight drop in voltage which could be corrected by the voltage regulators on the transformers. The ring main system shown in Fig. 4 also gives high security and can allow a double-circuit outage either in the ring main itself or on the incoming feeders.

Voltage Regulation. — Voltage regulation may be a factor which has to be considered when comparing ring main systems with radial systems. With the radial system shown in Fig. 2c the worst condition for voltage regulation is when one circuit is out of commission for any

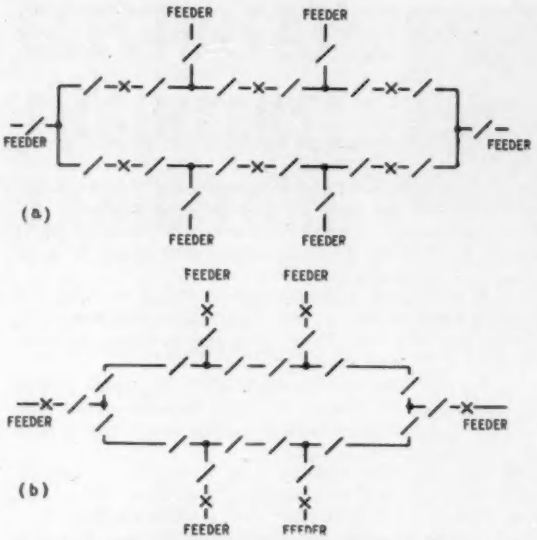


Fig. 5.—Switchgear ring systems. (a) Conventional mesh switchboard. (b) Ring busbar switchboard

reason, and this only affects one load intake point, but in the ring main system shown in Fig. 1c the voltage regulation problem is most acute and affects all load intake points when section A-B or A-D is out of commission. It is this factor which often limits the length of a ring main which can be supplied from one point. When generation is involved, the operating condition in Fig. 1c is one which, if there were generation at point " B," might cause concern regarding stability.

Switchgear Ring Systems.—The ring main system has been extended to switchgear layouts either in the form shown in Fig. 5a or 5b. The advantage of the former over the conventional double-bus layout is that no busbar protection is required since each circuit has two circuit-breakers and there is a section of busbar associated with each circuit which is included in the feeder protection zone. Bus-coupler and bus-section circuit-breakers are avoided so that there is a saving in such equipment. The disadvantages of the ring main or the mesh arrangement in Fig. 5a are inflexibility and difficulties in operation which are introduced when the ring main has to be opened for any reason, such as for the maintenance of a circuit-breaker. It is generally accepted that mesh arrangements as in Fig. 5a should be limited to four or five circuits.

The Central Electricity Generating Board employs a standardised layout for an outdoor installation of switchgear, particularly for use on a restricted site, which can be extended from a one-switch installation as shown in Fig. 6a to a four-switch mesh arrangement to connect four transformers and four lines as shown in Fig. 6b. Such an arrangement is very economical both in space and cost compared with the alternative conventional double-busbar arrangement. Although operationally the mesh arrangement is inflexible, it has the advantage that if there is any break in the ring, due say to a fault on a section of busbar, there would not be complete separation of circuits as with a single or double-busbar arrangement. Fig. 5b shows the ring busbar arrangement with busbar isolators between the circuit-breakers; while such an arrangement enables any section of busbar, with its circuit-breaker, to be isolated, it is extremely inflexible operationally.

Protection.—The protection of a radial distribution system can, in general, be made much simpler than that of

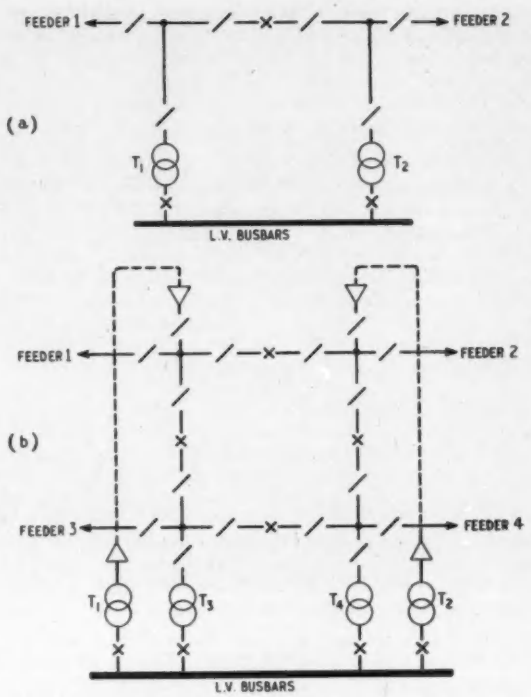


Fig. 6.—Outdoor switchgear layouts. (a) One-switch substation. (b) Four-switch substation

a ring main system. With duplicate radial feeders giving supplies to a load, the important rule in applying a non-unit protection scheme for those feeders is to ensure that, at the receiving end, the circuit-breaker of the faulty circuit is cleared directly and quickly by the local relays. When this has taken place, only one infeed to the fault from the supply source is left which can then be cleared with simple forms of protection such as overcurrent relays. An example is double transformer feeders in which, for a fault on the line of one circuit, directional relays at the receiving end, i.e., the l.v. side of the transformers, trip the l.v. circuit-breaker of the faulty feeder and the infeed from the supply source can then be cleared by distance or high-set overcurrent relays.

With a ring main system fed from one end, if pilot wire current-balance protection or directional comparison protection is not available between supply points on the ring, it is necessary to introduce directional relays to form a directional graded overcurrent scheme or to use distance relays. The disadvantage of the directional overcurrent scheme is that the overcurrent relay at the supply end has to have the longest time setting so that close-up faults in which the fault current is greatest are cleared in the longest time. However, such a system can be improved considerably by providing distance protection at the sending end of the outgoing feeders in the ring. In employing directional relays either for directional comparison, directional overcurrent or distance scheme, the possibility of sudden reversal of power flow during a fault on one circuit in the ring, illustrated by comparing the flow of current in feeder B-C in Fig. 1c for the normal condition and with one circuit out, is a matter which must be taken into account.

A ring main system in the house is normally supplied through a single fuse from the mains and the fuses for the units of load are contained either in the plugboard

itself or in the plug. These fuses are usually of the cartridge type and are of smaller rating than the main incoming fuse for the ring. With the radial system in the house, each circuit would be separately fused so that a fault on any one circuit should cause a shut-down of the load supplied by that circuit only.

Constructional Aspects

In house installations, a ring main system is undoubtedly cheaper to provide and easier to construct than the alternative radial system. With the latter, a large number of heavy wires are required from the main fuse-box, requiring more elaborate cleating and conduiting than the wires for a ring main system. With a ring main system, when extensions are required for additional points, all it is necessary to provide is a loop-in at the nearest point. To provide an extension with a radial system means a new connection from the main fuse-box which may involve a considerable amount of upheaval and inconvenience. As mentioned before, the ring main system for houses lends itself well to prefabrication, which is a cheap but effective method of wiring, using plastic or rubber sheathed wires.

With a transmission or distribution system a ring main scheme requires at each point of supply a site both for transformers and h.v. switchgear. The use of a radial system of transformer feeders normally avoids h.v. switchgear at the receiving point and so, from a constructional point of view, the radial system is to be preferred.

Ring main systems are used extensively to provide d.c. supplies in substations, both for closing and tripping circuit-breakers where, again, diversity is an important factor.

Conclusions

(1) A ring main system fed from one end for giving supplies to loads connected to the ring main is not as economic in conductor and insulation, and is more costly in losses, than an equivalent radial system, except for installations such as house wiring where provision must be made for all the load, or a large part of the load, to be supplied from any one point.

(2) A ring main system fed from one point only is a more difficult system to protect than an equivalent radial system fed from one point; also, the voltage regulation under certain outage conditions is greater.

(3) A ring main system supplied from several points, from which load is taken at several points and where high security is required, is more economic and effective than an equivalent radial system.

(4) A ring main system in a house, for supplying radiators and portable appliances, is more economic and easier to construct and extend than a radial system.

(5) A ring or mesh switchboard installation, in which the circuit-breakers are in series, employs fewer circuit-breakers than a double-busbar installation but is inflexible operationally.

E.R.A. REPORTS

Strain Gauge for Windmills.—In report Ref. C/T117 "The Development of a Method for Measurement of Strains in the Blades of a Windmill Rotor" by J. G. Morrison (price 24s) a description is given of a technique developed for measuring, by means of electrical resistance strain gauges, the strains set up in the rotor blades of a windmill driving an electric generator. The strain gauge elements are described, together with the methods used for their positioning, fixing and proofing. Details are given of the amplifying and recording equipment, and of the steps taken to ensure synchronisation between the recordings of generator power output, wind speed and strain. Brief descriptions of the windmill and its rotor blades are included.

The results obtained during the development tests are given in full, as well as the results obtained from a windmill simulator. It is shown that the methods developed are satisfactory for the measurement of blade stresses, and that they could be applied on most types of windmill. Further, the effect of the tower structure on the rotor blades is shown to be greater than that of any wind gusts likely to be experienced. Suggestions are made concerning the use of strain gauges in future research and development programmes and for further development of the methods of measuring wind speeds.

Water Main Corrosion.—The construction in 1956 of a large 275 kV/132 kV substation close to a water reservoir and filter station having extensive underground mains provided the opportunity to study the question of the influence of stray alternating current upon the rate of corrosion of water mains, and the results of this study are given in report Ref. V/T138 "Does Stray Alternating Current Corrode Water Systems? — Investigation of Installation at Rochdale" by G. Mole and D. P. Hammond (price 15s). The measured d.c. potential of the water mains with respect to the earth was taken as the criterion of the corrosion rate, and the following tests were made: (i) A.c. was injected into an isolated length of underground main; (ii) a.c. was induced in undisturbed mains under conditions simulating induction from overhead lines; (iii) measurements of d.c. potential were made at selected points on the water system over periods of time both before and after the substation was commissioned; (iv) a search was made for a correlation between changes in the d.c. potential of water mains and major load changes in nearby overhead lines. No evidence was found of any increased tendency to corrosion of the water system as the result of stray alternating current originating from the transmission system.

Shunt Capacitance Switching.—Report Ref. G/T 314 "Shunt Capacitance Switching: a Review of Published Information" by D. Worth (price 18s) is a résumé of literature dealing with problems raised in switching capacitor banks, unloaded cables and transmission lines. The principles governing the production of overvoltages and overcurrents in the system are outlined and the likelihood and nature of damage to circuit components is considered.

Both single-phase and three-phase circuits are dealt with, operating under normal or fault conditions. Resistance switching, which is widely adopted as a means of counteracting the disturbances produced by capacitance switching, is discussed in some detail. The criteria suggested for assessing the suitability of circuit-breakers for capacitance switching, and the methods of testing for these characteristics, are reviewed.

Copies of these reports can be obtained, at the prices stated, from the Publications Sales Department of the Electrical Research Association, Thorncroft Manor, Dorking Road, Leatherhead, Surrey.

ELECTRICAL ENGINEERS' EXHIBITION

OPENING CEREMONY AND LUNCHEON

General view of the Exhibition

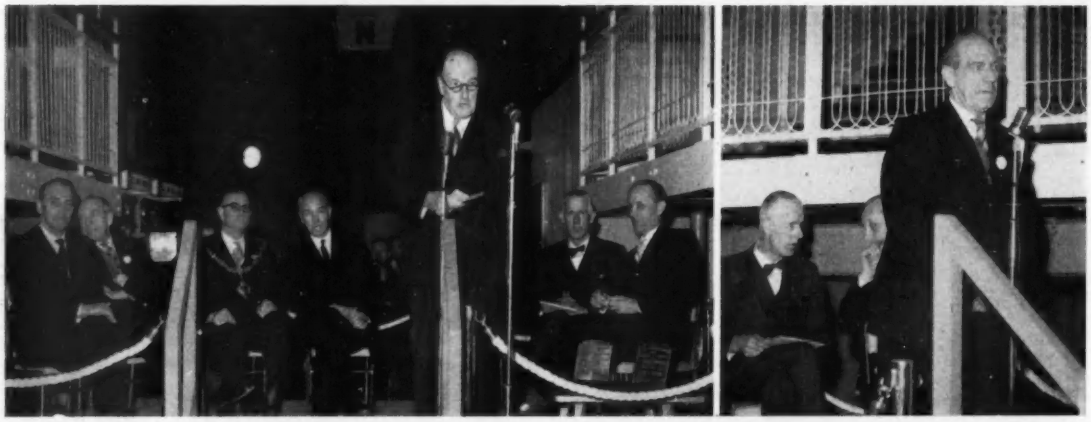
ON Tuesday last the eighth Electrical Engineers' Exhibition was opened at Earls Court, London, by Lord Brabazon of Tara. Lord Brabazon was introduced by Mr. J. H. K. Pendry, chairman of the Association of Supervising Electrical Engineers, who mentioned the leading features of this year's display.

Lord Brabazon characterised the Exhibition as "fascinating, educating and ornamental." It was fitting in the jubilee year of the Illuminating Engineering Society that lighting should be the main theme. He asked his audience to imagine the world without electricity. The only electrical items which had not shared in the general advance were primary and secondary batteries; if there had been an adequate secondary battery all the cars on the roads would now be electric. On this theme, Lord Brabazon said that while there must eventually be a saturation point for cars—when the roads were solid with vehicles—there was no such point for electricity.

In thanking Lord Brabazon, Sir Josiah Eccles, president of the A.S.E.E., said that the Exhibition was acquiring an international reputation—as Lord Brabazon had. Sir Josiah referred to the facilities which had been provided on the first floor and expressed the hope that exhibitors would take advantage of them.

Mr. Pendry then announced the winning exhibition awards. In the industrial section the plaque went to the Brush Electrical Engineering Co., Ltd., for its 300 kVA dry type flameproof mining transformer. Commendations went to Everett, Edgcumbe & Co., Ltd. ("Metrohm" insulation and continuity tester) and Rawlplug, Ltd. (RY2 vibrator drilling machine). In the domestic section the winner was Dimplex, Ltd., for its portable infra-red radiant fire. The Electrical Division of Radiation, Ltd. ("Tenten" suction cleaner) and Nettle Accessories, Ltd. (contemporary lampholder and ceiling roses) were commended.

At a subsequent luncheon, attended by many eminent electrical people, Mr. R. F. Mathieson, chairman,



Left: Lord Brabazon at the microphone. With him (left to right) are Mr. E. A. Bromfield (general secretary, A.S.E.E.), Mr. J. H. K. Pendry, the Mayor of Kensington (Councillor A. N. E. McHaffie), Sir Josiah Eccles, Mr. R. F. Mathieson and Mr. P. A. Thorogood (general manager of the Exhibition). Right: Mr. J. H. K. Pendry (chairman, A.S.E.E.) speaking at the opening ceremony

The Electrical Research Association and "Electrical Review" stands

Electrical Engineers (A.S.E.E.) Exhibition, Ltd., proposed the toast of the exhibitors. He thanked Lord Brabazon for his interest in the Exhibition and also made special mention of Lady Kilmuir, president of the Electrical Association for Women, who helped in the judging of the exhibits for the domestic award. He said that the rapid expansion of the Exhibition had brought problems but these were being tackled successfully. He thought that there was something of interest to everyone and he particularly hoped that overseas visitors would see what they wanted.

Mr. Leslie Gamage, chairman of the General Electric Co., Ltd., who replied for the exhibitors, thanked the organisers for what he termed "a truly amazing show." His company had a wide experience of exhibitions and he wished that they were all run on similar lines. Although there were too many exhibitions, the industry welcomed this one. It was a means of making contact between British manufacturers and overseas buyers. Pessimists thought that exports would dwindle as our overseas customers became self-sufficient, but he was convinced that British brains and enterprise would sustain export trade.

The electrical industry had long needed its own exhibition and this display met that need. Mr. Gamage said that the Exhibition continued to grow and it was high time that London had an adequate exhibition centre. He was glad to see emphasis placed on lighting this year for in this direction we led the world.

The proceedings were concluded by a brief speech by the Mayor of Kensington, Councillor A. N. E. McHaffie, J.P., who is well known in the electrical industry as a former director of the A.E.I.

The 60ft diameter electrically operated clock

Carrier Telephone System Equipment

EQUIPMENT which translates the speech frequency signals of each channel into an appropriate position in the basic group spectrum, using the single sideband suppressed carrier technique, forms the basis of most of the long distance carrier telephone systems used today, whether on coaxial or balanced pair cables, microwave radio or open wire lines. A fully transistorised channel equipment has been produced for this purpose by Standard Telephones & Cables, Ltd. Crystal filters provide full C.C.I.T.T. channel performance with a single modulation stage and, when used with standard 4 kc/s spaced carrier supplies, the equipment translates 12 speech circuits into the 60-108 kc/s basic group recommended for multi-channel carrier systems. The overall space requirement and power consumption are substantially reduced, the power supply required by a 12-circuit group being 12 W at 20 V.

ELECTRIC FLOOR HEATING PRACTICE

The series of five articles on this subject, by Mr. R. D. Jackson, published in the "Electrical Review" during December and January, are now available in booklet form. Applications for copies of the booklet (7s 6d each post free) should be made to the Publisher, "Electrical Review," Dorset House, Stamford Street, London, S.E.1, as soon as possible

VIEWS on the NEWS

By REFLECTOR

TELEPHONE operators in the Post Office service are generally a little remote but, unless provoked by ruffled or overbearing subscribers, are not usually impolite. The director general of the Post Office (who happens to be a past-president of the I.E.E.—Sir Gordon Radley) thought some time ago that a certain measure of "humanisation" of the service was desirable and he sent a party to the United States to study the working of the telephone service there. What the party saw and heard and their recommendations resulting from their studies are set out in a 29-page report which the Stationery Office has published. If their suggestions are generally applied (some have already had a preliminary run) a much more friendly atmosphere will be created—if the subscribers, too, exercise forbearance and do not expect excessive speed as well as politeness. The report also suggests other improvements in the service.

* * *

I.T.V.'s "Searchlight" was turned on to repairs on Monday evening. The principal subject was small domestic electrical appliances but there were also references to car repairs. From the investigations reported it seemed that about 75 per cent of the concerns undertaking the repair of electrical appliances were reliable, but many of these were criticised for other reasons—mainly for their excessive charges. A wide variation of quotations for the same job was disclosed and it was made obvious that a great many repairers trade on the public's ignorance of the nature of the work involved. There was shown to be a shortage of skilled electrical mechanics for this class of work and better training schemes were advocated. Manufacturers were blamed for some of the trouble; it was thought that they should scrutinise their dealers more thoroughly and encourage better after-sales service. I know that this is more easily said than done but, after all, the manufacturers suffer equally with the public if their products are brought into disrepute by inefficient or unscrupulous repair concerns.

* * *

There seems to be still a great deal of mystery surrounding the causes and cure of rheumatism and arthritis. For a very long time sufferers from these ailments have been more or less successfully treated by diathermy and hospitals have been equipped with expensive apparatus for the purpose. The *British Medical Journal* reports a series of experiments carried out at the Hammersmith (London) Hospital in which patients were treated by short-wave diathermy, infra-red rays, Faradic currents and wax baths. In each case there appeared to be some improvement after the first application. Then the patients were subjected to "diathermy" with the machine not switched on and it is said that there was no appreciable difference between the improvement in the patients' condition so obtained and that observed after the genuine application of the method. I know that there is a great deal in faith healing but it seems strange to me that a patient would not be aware that nothing was happening if he had had diathermic treatment on previous occasions. I still believe that victims of rheumatic diseases obtain great relief from electrical treatment, not just as a matter of faith.

* * *

Last Sunday's *Observer* introduced me to a new "approval" mark. It is one issued by the British Safety Council for application to "electrical appliances, motoring goggles and safety belts, and various other appliances," according to the information officer of the Council who wrote the letter containing this information. I am seeking further details, particularly of the "exhaustive tests" which are mentioned, resulting in a "technical report." If this report is accepted "the manufacturer is given a certificate and copies of the seal, which is a registered certification mark." In the meantime I must say that the multiplication of seals for electrical appliances should expedite the introduction of the one approval mark to end all other marks.

* * *

I am always interested in the way *Electron* (the journal of the Electrical Trades Union) handles financial problems. Dealing with investment in the electricity supply industry, the February number, after stating that of the £2,130 million required by March, 1965, is to be found from "internal resources," goes on to say:—

> "This means that the workers in the industry will be expected to produce this amount, in addition to the wages and outstanding interest payments on compensation and other stock, over the next seven years. They will also be burdened with the interest charges on the remaining £1,100 million as the net sum to be raised by borrowing."

The consumer, of course, gets his electricity for nothing.

* * *

Lamp standards are constantly under fire and for this reason I think it will interest many to read the following extract from the *Electrical Review* of 22nd March, 1889:

> "The Taunton Electric Light Company is not satisfied with having made Taunton famous for its successful electric street lighting, but is desirous of seeing the town acquire also a reputation for love of the æsthetic, or, at any rate, of the beautiful. In a letter which the secretary has just written to the Town Council, the company reminds the Council that a number of deputations is expected to visit Taunton during the present year to inspect the electric lighting arrangements, and that therefore the present is a good time to replace the existing lamp-posts by new standards of a more ornamental character. The old posts were erected for the sake of cheapness at a time when the success of the electric light was considered doubtful, and the electric light company thinks the time has now arrived when, pecuniary success having been attained, some regard should be had to the adornment of the streets."

PERSONAL AND SOCIAL

News of Men and Women of the Industry

At the annual meeting of the British Electrical and Allied Manufacturers' Association held yesterday (Thursday) **Mr. Leslie Gamage,** M.C., M.A., chairman and managing director of the General Electric Co., Ltd., was elected president and **Mr. W. K. G. Allen,** M.I.Mar.E., A.M.I.N.A., chairman and joint managing director of W. H. Allen, Sons & Co., Ltd., was elected chairman of the Council.

The choice of Mr. Gamage as this year's president is particularly appropriate, as apart from his chairmanship of one of the largest electrical organisations in this country, he was for many years president of the Institute of Export. He has travelled extensively overseas.

Mr. Allen also brings a wide knowledge of engineering matters to the counsels of the Association. He has been actively associated with many important bodies and associations, and is a past-president of the British Engineers' Association and a past-chairman of the British Internal Combustion Engine Manufacturers' Association.

Mr. L. Gamage

Mr. W. K. G. Allen

Mr. H. F. Wilson, A.R.I.C., A.I.R.I., F.R.S.A., Companion I.E.E., F.P.A., and **Mr. C. L. G. Fairfield,** M.A., M.I.E.E., A.M.I.Mech.E., Barrister-at-Law, have been appointed to the board of Submarine Cables, Ltd. (owned jointly by Siemens Edison Swan, Ltd., and the Telegraph Construction & Maintenance Co., Ltd.). They are directors of the Telegraph Construction & Maintenance Co. and have been appointed to the board of Submarine Cables as nominees of Telcon.

Mr. R. D. Baird, B.A., E.R.D., has been appointed a director of Baird & Tatlock (London), Ltd., and of Hopkin & Williams, Ltd., and **Mr. R. T. Beasley** has joined the B.T.L. group of companies as personnel manager.

Mr. R. W. Holmes and **Mr. T. J. Lawson** have been appointed to the board of the English Glass Co., Ltd. Mr. Holmes, a chartered secretary, remains as secretary of the company, a post which he has held for the last five years. Mr. Lawson is a mechanical engineer and is in charge of the development side of the company.

The Electricity Council has appointed **Mr. G. Morley Davies** to the post of press and information officer which he will take up early next month. Mr. Davies, who has been engaged in press and publicity work for many years, has been press and information officer of the Merseyside and North Wales Electricity Board for the past three years, and was previously press and publicity officer of the Port of Bristol Authority.

Mr. G. M. Davies

The appointment follows the retirement, after twenty-five years in the electricity supply industry, of **Mr. W. J. Hendry,** who has been the Council's public relations officer since it was established at the beginning of 1958.

Mr. Henry Brooke, Minister of Housing and Local Government, presented the main prizes of the illuminated sign design competition, sponsored by the **Electrical Sign Manufacturers' Association,** at the Savoy Hotel, London, on 9th March. He said he "rejoiced" that the Association had sponsored a competition for good advertising. He was sure that these competitions would stimulate and bring forward new ideas and people with new ideas. The winning designs showed ingenuity, taste, balance and good sense. Sir William Holford, replying to the toast to the competition judges, agreed with Mr. Brooke that illuminated signs should be made better and better and not suppressed. He for one would regret it if we did not have more interesting and more exciting electrical signs to make up for deficiencies in architecture.

Mr. J. A. Holden, who retired last December from the chairmanship of Magnetic & Electrical Alloys, Ltd., Burnbank, Lanarkshire, was given a complimentary dinner at the Golden Lion Hotel, Stirling, on 9th March by the directors and staff of the firm. Mr. A. A. Asplin, director and general manager, was among those present at the dinner, at which Mr. and Mrs. Holden were presented with a cocktail cabinet on behalf of the staff. Mr. Holden, who now resides in London, had been chairman of the company since its formation thirty years ago.

At the recent annual general meeting of the Radio and Electronic Component Manufacturers' Federation **Major L. H. Peter** handed over the presidency to **Mr. E. M. Lee,** B.Sc., M.I.E.E. (Belling & Lee, Ltd.). **Mr. K. G. Smith** (N.S.F., Ltd.) and **Mr. A. F. Bulgin,** M.B.E., M.Brit.I.R.E. (Bulgin & Co., Ltd.) were elected vice-presidents. **Mr. H. V. Slade,** M.B.E., J.P., T.D. (Garrard Engineering & Manufacturing Co., Ltd.), was elected chairman in succession to Mr. K. G. Smith, and **Mr. G. A. V. Sowter,** Ph.D., B.Sc., M.I.E.E. (Telegraph Construction & Maintenance Co., Ltd.) vice-chairman. **Mr. C. M. Benham,** B.Sc. (Painton & Co., Ltd.), was elected treasurer.

Mr. F. F. Batcheldor, M.B.E., a director of Small Electric Motors, Ltd., has retired and on 26th February he

Mr. K. J. Oldham (chairman, Electrical Sign Manufacturers' Association) speaking at the Association's prizegiving luncheon. Seated are (left to right): Lord Mancroft, Mr. G. S. Campbell (vice-chairman), Mr. Henry Brooke (Minister of Housing and Local Government), Sir William Holford, Mr. S. D. Moyse and Sir Harold Bellman

was presented with gifts from the company which included an electrical tool grinder and a radio set, and from his old colleagues who have served the company for twenty-one years and more, a barometer. Members of the staff also produced as a memento an electric motor of $\frac{1}{40}$ h.p. mounted in clear resin. Mr. Batcheldor joined Small Electric Motors, Ltd., in 1915 and was appointed to the board in 1938. The major part of his career with this company has been spent in close association with the Admiralty and other Government Departments.

The Ministry of Transport has announced that **Sir John Elliot** has requested to be released from the chairmanship of London Transport, and that it has agreed to his request.

Mr. J. A. Holloway has taken over the duties of sales manager of the Switchgear Department of the Simplex Electric Co., Ltd., Oldbury. He has been manager of the company's Bristol branch for the past four years.

Mr. J. A. Holloway

Mr. Holloway was educated at Westminster School and Loughborough Engineering College, and was commissioned in the Royal Artillery during the last war. He joined Tube Investments, Ltd., in 1947 and in 1949 went to Simplex to take over the responsibilities of flameproof sales. This position he relinquished when he moved to Bristol.

Mr. D. P. Prestwich has joined the board of Normand Electrical Co., Ltd.

Councillor Alan Troughton, reports *Public Service,* is to be the next High Sheriff of Gloucester. He is a senior service centre assistant with the Midlands Electricity Board.

Mr. P. F. T. Haeck has been appointed the manager of the Manchester sales office of Howells (Electric Motors), Ltd. He was until recently manager of the Manchester office of Verity's, Ltd., Birmingham, with whom he had been since 1948. Apart from the war years he was previously with Holsun Batteries, with whom he received his early training.

Mr. P. F. T. Haeck

The annual dinner of the **I.E.E. North-Eastern Centre** was held at Newcastle-on-Tyne on 13th March. The speakers included Sir William Scott (Jarrow Metal Industries, Ltd., and Armstrong Whitworth Co., Ltd.), who referred to the recent order placed with C. A. Parsons & Co., Ltd., Newcastle, for electrical generating plant for the Tennessee Valley Authority, and commented that the order had focused attention on the North-East, an area which, he stated, the rest of the country was apt to overlook. Mr. G. R. Hodnett (president, Newcastle Law Society) suggested the use of simpler terms in explaining technical matters. Ordinary people would understand technical questions more easily if a homely simile was used. Mr. S. E. Goodall (President of the Institution) said it was important to make it clear that in many aspects of electrical engineering Britain led the world.

Mr. J. H. Buying, Marconi Instruments' technical sales engineer for Africa, left London by air on Wednesday last for a three-month sales promotion tour of the African continent, during which he will visit the company's agents in nine countries.

Mr. F. B. Holt, M.I.E.E., a local director of Higgs Motors, Ltd., is paying a business trip to Africa and will be calling on agents and distributors and investigating the possibilities of developing new outlets. He will be visiting the Sudan, British East Africa, Northern and Southern Rhodesia, Portuguese East Africa and the Union of South Africa.

The annual dinner-dance of the **I.E.E. Supply Section** was held last week at the Connaught Rooms, London. The chairman of the Section, Mr. D. P. Sayers, B.Sc., M.I.E.E., proposed the loyal toast and welcomed the guests, among whom were the chairmen of the sister Sections. The President of the Institution, Mr. S. E. Goodall, thanked the chairman on behalf of the guests for the hospitality extended to them.

The twelfth annual dinner and reunion of the **Ex-Johnson & Phillips Association** was held at Grosvenor House on 7th March. Messrs. W. Glass, R. W. C. Reeves, G. T. W. Whitehead, A. C. Hartley and G. Ainsworth Wates attended from the board of Johnson & Phillips, Ltd. The toast of the Association was proposed by Mr. J. R. T. White (George Ellison, Ltd.), and Mr. H. D. Parsons (W. T. Henley's Telegraph Works Co., Ltd.), a member of the committee of the Association, replied, mentioning that membership had now increased to 216. Mr. J. Johnson Smith (Electric Construction Co., Ltd.) presented technical book prizes to Mr. P. Coffey and Mr. B. M. Pryor, who were invited to the dinner as being the two outstanding student apprentices at Charlton during the 1957-58 academical session. A cabaret followed the dinner.

At an informal dinner at the Connaught Rooms, London, W.C.2, on 26th February, **Mr. G. L. Walker** was presented with a pair of cut-glass decanters on a silver tray by Mr. L. H. Grundy on behalf of the sales staff of Dagenite Batteries (Pritchett & Gold & E.P.S. Co., Ltd.) to mark his retirement as manager after thirty-five years' association with the company. In thanking the staff, Mr. Walker expressed his appreciation of their loyalty and co-operation.

Mr. L. H. Grundy making a presentation to Mr. G. L. Walker (right) on his retirement as manager of Dagenite Batteries

Mr. Walker started his career as a trainee with Edmundsons Electricity Corporation and then became a technical assistant with Siemens Bros. Dynamo Works. His association with electric storage batteries commenced in 1920 and he joined the Pritchett & Gold & E.P.S. Co., Ltd., in 1924.

Major L. H. Peter, M.C., A.F.C., M.I.E.E., consulting engineer for the Westinghouse Brake & Signal Co., Ltd., is retiring from whole-time duties, but at the request of the company is continuing to represent it on the committees concerned with standardisation in the field of semi-conductors. He is moving to Ottery St. Mary, Devon, shortly.

Major L. H. Peter

Major Peter was educated at Blundell's School, Tiverton, Devon, and at the City and Guilds College, Finsbury, where he studied under the late Professor Silvanus P. Thompson. He gained experience with Ferranti, Ltd., the Fleetwood U.D.C., as a shift engineer, the Lancashire & Yorkshire Railway and the London Underground Railways, and on the outbreak of the 1914-18 war was mobilised in the Royal Engineers, being later transferred to the Royal Flying Corps, in which he attained the rank of flight commander. He joined the McKenzie, Holland & Westinghouse Power Signal Co., Ltd., in 1919, and this company later became the Westinghouse Brake & Signal Co., Ltd. He has served the

company for over forty years, as chief electrical engineer, then chief engineer, and finally as consulting engineer.

Major Peter has specialised in automatic railway signalling and, during the past twenty-five years, in semiconductors. He has served on the Council of the old Radio Manufacturers' Association and of the later Radio Industry Council and on a number of B.S.I. Committees. He was a founder member of the Radio and Electronic Components Manufacturers' Federation and has been its president for the past two years. He has been a member of the I.E.E. for over fifty years.

On Tuesday last week the **Lessa Music Society** (London Electricity Sports and Social Society) gave another of its popular "Music for All" concerts. On this occasion the concert was entirely instrumental, and it got off to a bright start with Rossini's overture to "The Barber of Seville." This was followed by the main work in the programme, Dvorak's "New World" Symphony, in the Largo of which the orchestra was particularly good. The highlight of the second half of the programme was the playing by Mr. Arthur Whitehead of the first movement of Grieg's No. 1 Piano Concerto, in which he displayed both technical skill and fine musicianship. This was preceded by a fantasia of melodies from the ballet "La Source," and the concert was rounded off with a number of Tchaikovsky's waltzes including the well-known "Valse des Fleurs" from the "Nutcracker Suite," and the waltz from "Swan Lake." Mr. Leslie Atkins' conducting was once again responsible for an altogether competent performance.

Mr. D. L. Brown, M.I.Mech.E., A.M.I.C.E., M.I.Gas E., A.F.R.Ae.S., has been appointed deputy manager of Smiths Aviation Division's Research Department at Cheltenham. He joins the Division from the School of Gas Turbine Technology, Farnborough, where he was principal. He is a Freeman of the City of London, a member of the Guild of Air Pilots and Air Navigators and was, from 1956 to 1958, chairman of the Southern Branch of the Institution of Mechanical Engineers and a member of the Council.

Mr. D. L. Brown

Mr. R. E. Gleadow, district commercial engineer of the Bolton District of the North Western Electricity Board, has been appointed senior assistant engineer in the Commercial Department of the Board's No. 6 Sub-Area which is centred on Kendal and embraces Cumberland, Westmorland and the Furness District. Mr. Gleadow served with the Hull Corporation Electricity Department and the Yorkshire Electricity Board before becoming district commercial engineer at Tunbridge Wells for the South Eastern Electricity Board in 1951. He joined the North Western Board at Bolton in 1955. During the war he served in the Royal Corps of Signals and Royal Engineers, attaining the rank of captain. He now holds a commission in the Territorial Army (R.E.M.E.).

The article appearing in this issue on "Ring Main Concept" is contributed by **Mr. W. Casson,** M.I.E.E., transmission design engineer, Central Electricity Generating Board. Starting with the former Central Electricity Board (South-East England Area) as a senior assistant in the technical department in 1934, he became deputy technical engineer in 1944 and held this position until vesting date, when he was appointed technical engineer in the Eastern Division. He was appointed system design and development engineer at headquarters in 1952 and held this post until 1954 when he succeeded Mr. F. J. Lane as transmission design engineer.

Mr. W. Casson

Mr. Casson is the author or joint author of seven Institution papers and obtained a Transmission Section Premium in 1942 and the Silvanus Thompson Premium in 1944. He is joint author of three C.I.G.R.E. papers and has contributed many articles to the electrical Press.

Mr. E. Brown, A.M.I.E.E., commercial engineer, Northern District, London Electricity Board, retired on 6th March and at a gathering of his friends and colleagues the district manager, Mr. R. H. Rawll, presented a bookcase to him on their behalf. Mr. Brown commenced his career in the electricity supply industry in 1909 at Kingston-on-Thames and after experience at Dover joined the Stepney undertaking as charge engineer. Following service with the London Electrical Engineers in the 1914-18 war, he became consumers' engineer at Stepney and served in a similar capacity at Portsmouth, Southampton and Blackburn, going to Hackney in 1928 as sales manager. During the last war he was with the Air Ministry, Mechanical and Electrical Works Department, and subsequently returned to Hackney where, on nationalisation, he became district commercial engineer, taking up the position of commercial engineer of the Northern District in 1957 when it was formed under the reorganisation scheme of the Board.

Mr. F. C. Boys has been appointed as a commercial assistant to the product manager of the Electro-Acoustics Department of Philips Electrical, Ltd., and will be responsible for the marketing of the company's new dictation machine.

Mr. W. Barrington Dalby, who has been sites and wayleaves officer for the Watford District of the Eastern Electricity Board since vesting day, is retiring at the end of this month. He joined the Watford Corporation Electricity Department in 1919 on demobilisation from the R.N.A.S., and served in the Mains Department before being appointed consumers' engineer in 1930.

Mr. J. Yates has been appointed manager of Clarkson Engineering (Canada), Ltd., and will be working from the Toronto office at 767, Warden Avenue, Scarborough, Toronto. **Mr. A. Goodey** has succeeded Mr. Yates as northern area manager for Clarkson (Engineers), Ltd., operating from the Manchester office.

Mr. P. W. Underhill, chief shipping officer with Birlec, Ltd., has been elected chairman of the West Midlands Branch of the Institute of Export.

Mr. S. Hack is retiring at the end of this month after fifty-three years' service with the General Electric Co., Ltd. He joined the company's head office in London in 1906 and gained experience in a number of departments including nearly five years as a traveller. When, in 1928, the G.E.C. decided to open a branch at Plymouth, Mr. Hack was selected to be the first manager. He established the new branch and remained there as manager until April last year when he returned to the head office in London as personal assistant to the sales director.

Mr. S. Hack

Over 460 members and guests attended the annual dinner of the **I.E.E. North Western Centre** held at the Midland Hotel, Manchester, on 10th March, Mr. F. J. Hutchinson, the acting chairman of the Centre, presiding. The toast to the Institution of Electrical Engineers was proposed by Dr. Ralston Paterson, director of the Christie Hospital and the Holt Radium Institute. Dr. Paterson spoke of the collaboration between the electrical and medical professions in several projects, from the gas-filled tubes originally used in radio-therapy to continuously evacuated X-ray tubes, and the megavolt equipment developed in the post-war years and now used in the treatment of cancer.

In his reply the President of the Institution, Mr. S. E. Goodall, referred to the friendly relationship between the two professions and to the

At the I.E.E. North Western Centre dinner. Left: Dr. C. Whitworth, Sir Willis Jackson, Mr. S. E. Goodall (President), Dr. B. V. Bowden, Mr. H. West and Alderman L. M. Lever. Right: Alderman S. W. Davis, Dr. Ralston Paterson and Mr. F. J. Hutchinson (Centre chairman)

Medical Electronics Discussion Group which was started following an approach by the medical profession and which now had the support of over 400 members from both professions, each meeting attracting an average attendance of 120.

In proposing the toast to the guests the chairman gave a brief account of the Centre's activities during the year and read a short extract from a letter, expressing good wishes for the Centre, that he had received from the Centre's chairman, Professor F. C. Williams, who now occupies the chair of electrical engineering at the University of California. The response was made by Alderman L. M. Lever, Deputy Mayor of Manchester.

Lord Plowden, K.C.B., whose term of office as chairman of the United Kingdom Atomic Energy Authority expires at the end of this year, is to be the new chairman of the British Aluminium Co., Ltd., and he will take up this post next year. He will at the same time become vice-chairman of Tube Investments, Ltd., which, with Reynolds Metals, controls the British Aluminium Co. Sir Ivan Stedeford, chairman of Tube Investments, is at present chairman of the British Aluminium Co. Lord Plowden has been chairman of the U.K.A.E.A. since 1954 and was previously chief planning officer and chairman of the Economic Planning Board. During the war he served at the Ministry of Economic Warfare and the Ministry of Aircraft Production. He was created a life peer in January last.

Lord Plowden

OBITUARY

Mr. Harry Webber, who had been branch manager at Clevedon for the South Western Electricity Board since 1948, and who had been in the electricity supply industry in Somerset for over forty years, died at the Southmead Hospital, Bristol, on 11th March at the age of fifty-eight.

Mr. Webber received his early training with the Burnham District Electricity Supply Co., and from 1919 to 1922 was with Porter & Co., of Bristol. In 1922 he rejoined the Burnham electricity undertaking and in 1931 was promoted to be assistant to the engineer and manager. He was appointed assistant to the Clevedon branch manager of the North Somerset Electricity Supply Co. in 1936 and three years later became Clevedon branch manager and district engineer, being appointed branch manager of the South Western Board at Clevedon on nationalisation of the industry.

Mr. S. R. Phillips, manager and director of William Dow & Sons, Ltd., electrical engineers, Kilmarnock, died on 10th March. He became manager of the company 28 years ago and was later appointed a director. He was a member of the Central Board of the Electrical Contractors' Association of Scotland, chairman of the Association's Ayrshire branch, and a founder member of Kilmarnock and District Electrical Society.

Mr. William McFarlane, O.B.E., B.Sc., M.I.E.E., who retired from the position of chief generation engineer (operation) of the South West Scotland Division of the British Electricity Authority in 1953, died on 13th March. Mr. McFarlane had considerable experience in industry before joining the Central Electricity Board in its early days as operation engineer for the Central and South Scotland schemes, and he became chief generation engineer (operation) of the South West Scotland Division, B.E.A., on vesting date.

Mr. G. W. Thorn, chief cashier of W. T. Henley's Telegraph Works Co., Ltd., died on 2nd March. He had served the company for forty-four years and became chief cashier in 1941.

Second Transatlantic Telephone Cable

H.M. telegraph ship *Monarch* has sailed from Erith to lay the first 1,300 nautical miles of the second transatlantic telephone cable from Penmarch, France, out towards Clarenville, Newfoundland. This cable is part of the 2,245 nautical miles (nearly half) which Submarine Cables, Ltd., are producing of the total required by the American Telephone & Telegraph Co. The remainder of the cable is being supplied by the Simplex Wire & Cable Co. of America (690 nautical miles), Cables de Lyon of France (1,000 n.m.) and Felten & Guilleaume of Germany (1,000 n.m.). The cable being manufactured at Erith will cost over £3 million. In May c.s. *Ocean Layer* will participate in the laying, which is expected to be completed in August.

The complete system between the United States, France and Germany will cost about £14 million and will be owned jointly by Long Lines, the American Telephone & Telegraph Co., the French Ministry of Posts, Telegraphs and Telephones, and the German Federal Ministry of Posts and Telecommunications.

The main crossing, like the first transatlantic cable, will require two cables with single-way repeaters, but the link between Newfoundland and Nova Scotia will be made with a single cable fitted with two-way repeaters manufactured by Standard Telephones & Cables, Ltd., and Submarine Cables, Ltd.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £180 0s 0d
COPPER, H.C. Electro	ton £257 10s 0d
Fire Refined 99·70%	ton £256 0s 0d
Fire Refined 99·50%	ton £255 0s 0d
COPPER Tubes ..	lb 2s 5½d
Sheet	ton £286 10s 0d
H.C. wire and strip	ton £302 15s 0d
LEAD, English ..	ton £69 15s 0d
Foreign	ton £68 0s 0d
MERCURY	flask £75 0s 0d
TIN, block (English) ..	ton £782 10s 0d
ZINC, G.O.B. Foreign	ton £75 10s 0d
BRASS Tubes (solid drawn)	lb 1s 11½d
Wire	lb 2s 9d
PHOSPHOR BRONZE Wire	lb 4s 2½d
PLATINUM	oz £28 10s 0d
RUBBER, No. 1 R.S.S. spot	lb 26½d—26¼d

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Electrical Manufacturers and Building Costs

I DO not think there is very much about which Mr. Hellard and I would disagree concerning the role of the architect—indeed, there is much criticism I would make concerning the literature made available by electrical manufacturers. I think Mr. Hellard will agree, however, that some of the most successful jobs have resulted from the closest collaboration between the architect and his team made up of main contractors and specialist sub-contractors, where each member of the team has a responsibility to make *and justify* his recommendations, having regard to the project in hand and the requirements to be satisfied.

It is inescapable that an ever-increasing proportion of the total costs of a building project will be devoted to the electrical services. When I was a young man it was reckoned to be about 2½ per cent; today it is three or four times that proportion.

As to the suspicion of architects that "the services cost far more than they need do," I would say at once that I know of many installations where I would agree with Mr. Hellard wholeheartedly, but the reasons for this situation are poor site organisation, delayed decisions and *ad hoc* alterations, which can be terribly expensive.

On the other hand, an electrical installation put in today has got to take care of tomorrow, and a reduction in costs, brought about by limiting the capacity of an electrical installation, can often prove to be a most unsatisfactory situation. Here, then, is another reason why the specialist should be brought into full partnership in a building project, because if he is good at his job he can not only advise on the best current procedures, but can also report on *trends* which may well influence the decision of the architect and his client.

It goes without saying that the situations envisaged are only those in which the architect cannot persuade his client to employ the services of an electrical consulting engineer.

London, E.C.4. J. MORTIMER HAWKINS,
Managing Director,
Mortimer, Gall & Co., Ltd.

13 A Socket Outlets

I AM very interested in the correspondence on 13 A sockets because about 18 months ago I carried out a review of every one of the flush sockets then on the market, both switched and unswitched. My conclusions were very definite and somewhat surprising. At that time only one make could be considered of first-class design; one other make was "quite good" and the rest were in my opinion not worth buying at all, if they were to get hard use. It is possible that a few better designs are now available. Only on the one make was any serious attempt made to ensure good electrical contact between the pins and the socket (the sockets being spring loaded); the shutter was also excellent. Many of the shutter designs were horrifying in their flimsiness and complexity. Most of the sockets were bits of soft brass bent up into U-section. Nearly all were outside the B.S. tolerances for withdrawal pull and many pins were also outside B.S. tolerances. Your correspondent Mr. C. A. Cameron Brown does not say what make of sockets has given so much trouble, but it is quite likely he has bought one of the "99 others."

My investigation was in an official capacity for a department which has standardised 13 A B.S. 1363 sockets. For my own part I would not use them at all. My own house has 5 A three-pin and 15 A three-pin and always will have. The only "advantage" of the 13 A is in the economy of wiring the ring main; I can see no other advantage. From a safety point of view since everyone uses 13 A fuses for all purposes, the "protection" afforded by this fuse to a radio set, reading lamp, etc., is virtually nil—the 13 A fuse does not blow till about 30 A is reached.

Mind you, there are also some very bad designs of 5 and 15 A sockets on the market, but in general they are much more workmanlike jobs and excellent adaptors are available, both multi-outlet and 15 to 5 A. They do not fall out of the socket in the way the 13 A adaptors do, but B.S. 1363 never intended adaptors to exist. Since the maximum/minimum withdrawal pulls are, from memory, only 8 lb and 2 lb on the 13 A socket this problem will always exist. Some I tested came out with less than 2 lb pull.

I fully share Mr. Cameron Brown's view that the 13 A socket is not the answer to the maiden's prayer. Standardisation is an excellent aim but we must standardise on something first class. There is also this fundamental difficulty in changing to 13 A: it cannot be introduced into an existing house for extra sockets or to replace broken 15 or 5 A sockets without extensive alterations to the wiring. Unless the whole house is changed over to 13 A (a costly job), the addition of only one or two 13 A sockets is unthinkable while there are no adaptors from 15 to 13, 13 to 15 or 13 to 5 A (or are there now some?).

Horndon-on-the-Hill, Essex. R. C. K. MONEY.

Plastics Exhibition

MORE than 270 manufacturers and suppliers of materials will be participating in the International Plastics Exhibition which is being held at Olympia, London, from 17th to 27th June. The exhibition will occupy more than 250,000 sq ft of floor space and, as in the previous exhibition in 1957, will include displays of equipment from thirty countries.

Materials to be shown will include all the well-established thermoplastics and thermosettings with a wide variety of products made from polypropylene, high density polythene and cellulose proprionate, which will be shown in quantity for the first time in this exhibition. The equipment section will contain many new types of plastic welding machines. A fully automatic compression moulding press incorporating power loading with complete control of both cycle time and temperature will be on view. The international design display will contain a section for best design products in use in the home and will be drawn from twelve different countries.

A convention has been arranged to run concurrently with the exhibition. A special section will be devoted to recent technical developments in the glass reinforced plastics field, with reports from Europe and the U.S.A. Other subjects to be discussed during the convention will include developments in epoxy resins and the properties and moulding characteristics of polypropylene.

The exhibition and convention are being organised by the journal *British Plastics.*

B.E.A.M.A. in 1958-59

ANNUAL REPORT OF THE COUNCIL

WORLD economic conditions and the Government's efforts to avert a recession form the background against which the Council of the British Electrical and Allied Manufacturers' Association reviews in its annual report the activities of the past twelve months. The review opens with a reference to the recovery in the prices of certain raw materials, a trend which it is considered should assist the producing countries to import more manufactured goods and encourage them to proceed with plans for developing their resources. At home the domestic appliance side of the industry has already benefited from the change in the Government's policy from restriction to expansion; and the easier credit facilities, the promise of increased public investment and more overseas lending should provide a much needed stimulus to orders for capital plant.

Though the electrical industry did not suffer such a severe fall in orders as some industries, order books are not as full as they have been. Owing to improved methods of production and quicker deliveries of materials many firms can show an increase in output, but the resulting economies have been virtually offset by rising labour costs and keener competition has meant reduced profit margins. With the recovery in employment in the second half of 1958 the total number of workers in the industry in December was 726,900, which was only marginally less than a year earlier.

Further Rationalisation Foreshadowed

The Council refers to 1958 as a momentous year in the history of the electrical industry. The year 1959, though full of promise, will be a hard one with competition intensified both at home and abroad. The process of rationalisation which is evident in the recent amalgamations will probably continue, and is "indicative of the efforts which the industry is making to prepare itself for the challenging years which lie ahead."

Referring to the smaller amount of generating plant commissioned last year, the Council states that this was largely due to the Government's policy of restricting capital expenditure in the nationalised industries as far back as 1953. The electrical supply and manufacturing industries have to make long-term plans for their capital investment, and the Council points out that unexpected curtailment of the investment programme results in inefficient execution.

However, over 1,100 MW of generating plant was exported last year compared with 900 MW in 1957. The year was also notable for the commissioning of two 120 MW turbo-alternators and sets of higher rating up to 550 MW are under construction. The Council makes only a passing reference to the problems which the installation of a smaller number of larger sets brings to manufacturers and the plans for increasing the usefulness of the C.E.G.B. Co-ordination Committee, which are now being put into effect, are not explained. Much useful work was done by the Electricity Boards/B.E.A.M.A. Joint Committee. Among the subjects discussed were transformer and switchgear standardisation, statistics of cooker sales, and the future of the British Electrical Power Convention.

It is felt that Britain will derive little from the recent agreement with Euratom regarding the supply of nuclear reactors and fissile material. The conditions under which the Government undertakes to provide fuel for British built, and possibly other, reactors compare unfavourably with the American offer of a ten-year supply of enriched fuel on easy terms.

Railway Electrification Conference

The B.E.A.M.A. is to co-operate with the British Transport Commission in a conference and exhibition to mark the opening of the first section of a.c. electrification at 25 kV between Crewe and Manchester. It is hoped that the conference and exhibition will attract world-wide attention to British developments and also stimulate the export of electric traction equipment. There is an increasing demand for electrical engineers trained in traction, and progress has been made with the plans for a special course at Imperial College which will enable graduate engineers to specialise in this subject. A readership in electric traction engineering is projected with financial support from both the B.T.C. and B.E.A.M.A. member-firms.

Replies to a questionnaire circulated by the Education Committee revealed that 76 out of 400 firms belonging to the Association were undertaking the training of overseas engineering students; 852 students were trained in 1956 and 959 in 1957. Sixty per cent of these were trained by the largest firms in the industry. The numbers to be placed are not, therefore, considered beyond the capacity of the industry if medium-sized firms were willing to assume a bigger share of this responsibility. The Committee had an informal meeting with the Engineering Board of Studies of the Hives Council, to express the doubts felt by the industry whether sufficient attention is being paid to the standard of practical training in the award of the Diploma in Technology. At present the approving authorities appear to lean too much on academic advice in regard to the industrial training element of the sandwich courses. Further consideration has been promised.

Restrictive Trade Practices

Discussing at some length the activities of the Restrictive Trade Practices Court, the Council says that the judgment in the Yarn Spinners' Agreement has made it clear that no case can be argued under the "gateway" relating to unemployment. This judgment also shows that even when the Court accepts the arguments under any of the "gateways," it may still overrule them when striking a balance between the advantages of the arrangements and the detriment they cause to the public interest.

Though it considers that there can be little quarrel with the underlying logic of the judgment, the Council suggests that either the law is far too rigid and needs alteration, or that the Government should give industry some assurance that where hardship will undoubtedly arise from Court judgments steps will be taken to limit the long-term effects which may also be detrimental to the public interest.

"It seems apparent [it continues] that the dangers inherent in the strict operation of the Act have not been sufficiently appreciated, either in industry or by Members

of Parliament. It must be emphasised that it is not sufficient to look only at the short-term advantages of the abrogation of co-operative arrangements built to meet the stress of economic crises, but that a long-term view is required, particularly when dealing with capital goods industries.

"It is time for clear and honest forward thinking, not only by the manufacturers but also by those concerned with these matters in the Government, who must bear in mind that they are not matters which should be regarded as subjects for party politics. The outcome of the successful operation of restrictive practices legislation will settle national commercial policy and industrial organisation for many years to come. The nation cannot afford to make a mistake which may have far-reaching adverse effects on the national economy."

Increased Publicity

The publicity activities of the B.E.A.M.A. have expanded in recent years, and the Council has much to say on the Association's part in the Brussels Exhibition and, through the Nuclear Energy Trade Associations' Conference, in the Hanover Fair and the Geneva nuclear energy conference and exhibition. The Brussels booklet "Serving the World" was presented to 15,000 visitors to the exhibition and a further 25,000 were sent to overseas buyers. A complementary booklet, "Leading the World," published yesterday, emphasises the industry's leading role in the national economy, and is aimed at informing opinion in this country. It is thought particularly desirable to publicise the industry's achievements widely at this moment, since unless the facts are known it is possible for the industry's contribution to the national welfare to be undervalued.

During the period under review the talks on the establishment of a national approvals scheme were widened to include the supply industry and the Electrical Development Association and a solution acceptable to all sides of the industry is now being energetically sought. The Council states that domestic appliance manufacturers are fully aware of the need for a testing and approvals authority to protect the public against unsuitable and unsafe appliances but consider that it would be against the long-term interest of the industry if an imperfectly organised plan were adopted.

Slow progress is also being made with the adequate wiring campaign. A B.E.A.M.A. Adequate Wiring Campaign Committee has been formed and as a first step proposals are being submitted to the Sections concerned, indicating the immediate manner in which they can actively participate. An E.D.A.-E.C.A.-E.A.W.-B.E.A.M.A. Co-operative Committee is engaged on the preparation of technical and other recommendations and the E.D.A. and E.A.W. have issued, or are about to issue, booklets. The campaign envisaged "is based on a policy of economy and education, that is of starting up in an inexpensive way and progressively building up to a campaign directed to the public." The B.E.A.M.A. Council continues to press for an additional representative of the manufacturing industry on the board of the National Inspection Council.

In an endeavour to satisfy as many as possible of the viewpoints represented in the Working Party on International Arbitration the Secretariat of the Economic Commission for Europe has produced a draft set of arbitration rules of "appalling complexity" and the doubt is expressed whether anything of practical value will emerge. It is not clear whether the E.C.E. Working Party on International Contract Practices will pursue its study of general conditions for "pure erection"—that is, erection of plant supplied by a different contractor. The B.E.A.M.A. considers that a set of conditions for stock articles would be more useful, but a majority of Western European trade associations favour the original E.C.E. project, though nobody seems able to produce any experience of the type of contract involved.

The Association will be represented at the first meeting of the management committee of the "Conseil Européen de la Construction Electro-Domestic" which is to be held in Milan this month. The B.E.A.M.A. proposal that there should be only one class of membership (as against Common Market members and associate members) was accepted. A Domestic Appliances Division under a Divisional Board is being considered by the Council and the Heat Control Devices Committee has been reformed as the Thermal and Appliance Control Section. It will cover thermostats, temperature regulators and switches up to and including 25 A, 250 V, for domestic appliances.

The Association of Short-Circuit Testing Authorities had an exceedingly busy year. Among the problems under consideration are the desire of British manufacturers to be able to obtain certificates of rating in accordance with foreign specifications and the growing requests from foreign manufacturers for certificates of rating for their equipment in accordance with British standards. New rules will be published shortly governing the short-circuit testing of circuit-breakers and automatic switches in combination with fuses and fuse-links, and there will be similar rules covering the testing and certification of miniature circuit-breakers.

Overseas Trade

As in previous years a substantial section of the report is devoted to export activities. The total value of exports of electrical and allied equipment last year was £276·4 million, or 1 per cent less than in 1957. If cables and wires are omitted, all other exports increased by £7·2 million, or 3 per cent. The apparent decline in exports of wires and cables is attributed to the unusually high orders in the previous two years. There was a fall of nearly £2 million in exports of domestic appliances but it is hoped that the figures for 1959 will be the "highest ever." There are indications that the electrical exports of the United States have fallen to a degree comparable to those of this country and those of Western Germany to a more serious extent.

Exports to Commonwealth countries represented 57·6 per cent of the total compared with 54·3 per cent in 1957. Exports to the Common Market countries fell slightly to 9·2 per cent and those to the remaining O.E.E.C. countries rose to 9 per cent. Exports to other countries fell to 24·2 per cent compared with 27·2 per cent in 1957. The 16 O.E.E.C. countries took 18·2 per cent of our exports compared with 18·5 per cent in 1957.

Concern is expressed at the failure to establish a Free Trade Area and the consequent destruction, at least temporarily, of the fundamental O.E.E.C. principle of non-discrimination. The action of France in liberalising her quotas and devaluing the franc has made the position "decidedly better than it would have been," but the formation of rival blocs to the Common Market does not appear to be viewed with any favour. "A more serious result of continued discrimination" might be the disbanding of the European Monetary Association. The possibilities of increasing trade in electrical products with O.E.E.C. countries are being studied by an economist and a report, to be published in two parts, will cover the general economic background and, in more detail, market trends and potentialities, and methods of trading and organisation.

In emphasising the importance of opposing applica-

tions for tariffs in Commonwealth countries, the report is able to point to three cases in South Africa that were decided in favour of overseas manufacturers. The re-imposition of import licensing by New Zealand proved a severe blow to domestic appliance manufacturers but it did not bear so heavily on manufacturers of heavy plant.

The report reviews the activities of the Export Panel, the Overseas Committees and the Domestic Electrical Appliances Section Export-Import Committee. This last committee was successful in getting H.M. Customs to provide a more detailed analysis of imports of home laundry equipment and to sub-classify exports of thermostatically controlled irons. A matter of some concern is the 40 per cent *ad valorem* duty imposed by Eire (though her exports enter the United Kingdom free of duty) and the possibility that some appliances imported from Eire are assembled there from Continental parts.

An investigation is being made of Russia's capacity as a manufacturer of domestic appliances and though Russia has been advertising appliances in India competition has been negligible. The Committee reaffirmed the policy that the twelve-month guarantee period on goods sold on the home market should also apply to exports.

During the year thirty-six members of H.M. commercial and consular services visited the B.E.A.M.A. under the structure of industry course arrangements. An account is given of many outside committees on which the B.E.A.M.A. is represented and which cover such subjects as competition from low cost countries, finance for export, and Middle East trade. The help given by the B.E.A.M.A. to the various United Nations Economic Commissions is described and reference is made to the work of the B.S.I. Export Advisory Panel, the Weir Committee on Export Trade Facilities, the Advisory Council on Overseas Construction, of the Organisme de l'Liaison de Industries Métalliques Européennes, and the B.S.I.-C.S.A. approvals agency, for which a new centre is being opened at Hemel Hempstead in May. This will include a small electrical laboratory.

The remainder of the report is devoted to reviews of the activities of the Council Committees and to the work of the many Sections and Technical Committees.

LLOYD'S REGISTER OF SHIPPING

INSPECTION AND SITE SERVICES AT ATOMIC POWER STATIONS

THE work of the Land Division of Lloyd's Register of Shipping last year increased by 25 per cent. This is attributed, in part, to a growing recognition of the value of their inspection and site services for both nuclear and conventional power stations, and the 1958 report records that the difficulty of keeping abreast of the demand with qualified technical personnel is being overcome.

The nuclear stations at Bradwell and Berkeley have now reached the stage where two resident surveyors are required at each site. Three site surveyors are employed full-time at Hunterston and two are stationed at Chapelcross. The Society has also been engaged to supervise the construction of the 200 MW nuclear power station being built in Italy by the Nuclear Power Plant Co. The surveys cover the initial appraisal of designs, specifications, welding procedures, etc., and the inspection during construction at the makers' works in the United Kingdom, Italy and elsewhere of component parts of the primary gas circuit, major auxiliaries and steam generating plant. Supervision of erection and final testing on site are also to be undertaken, with special strain gauge investigation on the completed reactor vessel under final pressure test. In this country the Society hopes that its considerable experience will be used in connection with work required under the proposed Nuclear Installations (Licensing and Insurance) Bill.

Nuclear Propulsion

The detailed appraisal of the application of the advanced gas-cooled and other types of reactor for ship propulsion being made by the Atomic Energy Authority, the Admiralty and industry, under the ægis of the Civil Lord's Committee, should by this spring have progressed sufficiently for the committee to make recommendations on the most suitable type or types of reactor for a British nuclear surface ship. It will then be necessary to consider how and when the ship can be financed, built and operated.

The Society believe that a decision must be made on the basis of present knowledge and experience of land based reactors. Since lack of operating experience under marine conditions may handicap future commercial development, it is, they assert, important to start building up this experience even when a reactor may not yet be commercially attractive. Present designs of reactors are unlikely to be used in ships of less than 20,000 s.h.p. and operating costs also appear to be higher than with conventional propulsion machinery. The use of plutonium from power reactors could, however, result in enriched fuel at reasonable cost.

The report points out that British thinking is aimed at an economic installation, offering at least some prospect of competition with conventional propulsion plant of proved reliability. Though likely to be uneconomic in operation, the U.S. *Savannah*, which will be at sea in 1960, will, however, provide Americans with valuable operating experience. This ship will also postulate questions of international significance, such as safety arrangements, and acceptance in ports, disposal of waste products and insurance, which are being proposed for discussion at the International Conference on Safety of Life at Sea to be held in London in 1960. Most other maritime countries are stated to be interested in the nuclear propulsion of merchant ships. The Russian icebreaker *Lenin* is advancing in construction, and France, Sweden, Holland, Norway, Germany and Japan are all busy with studies for nuclear ships, "aware that if the challenge is not accepted their shipowners and industry may be placed at a disadvantage." To assist the chief surveyors in the formulation of the Society's basic requirements for the classification of nuclear ships the Technical Committee have set up a nuclear propulsion panel.

A table at the end of the report analyses world tonnage by type of propulsion since 1933. It shows that at the end of last year steamships with a total gross tonnage of 5·3 million tons had turbo-electric propulsion and motor ships totalling 335,272 tons gross had diesel-electric propulsion. One of the largest a.c. systems so far approved for marine use will be installed in the *Canberra*, under construction at Belfast. It will consist of two 32,200 kVA, 6,000 V a.c. turbo-generating sets for the propulsion machinery and four 1,850 kVA, 440 V a.c. turbo-generating sets.

For some years, manufacturers in Germany have been producing self-regulating a.c. generators for marine service and their use has now extended to this country. Although with the greater use of a.c. for main installations there has been an increasing use of a.c. deck machinery, silicon rectifiers may be developed for use with d.c. machinery. Miniature circuit-breakers are now being extensively fitted, especially in German and Italian built ships; in the latter it is almost to the exclusion of fuses.

New Books

Radio Communication. By W. F. Lovering. Pp. 536. Longmans, Green & Co., Ltd., 6 and 7, Clifford Street, London, W.1. Price 60s.

Those fundamentals of radio communication theory required by students taking degrees in light current engineering or the Higher National Certificate have been covered by Mr. Lovering in a single volume. Many examples, with answers, from London University and I.E.E. papers are included. The component parts of the circuit are dealt with first, then circuit functions and finally some special questions. Thus, the first eight chapters deal with tuned circuits, simple filters, transformers for l.f. and r.f., sound reproduction and valves, etc., while amplification, feedback, oscillation generation, detection and modulation are covered in the next nine chapters.

Aerials, line transmission, propagation, c.r.t.'s and transistors all receive chapters in the final part of the book. The wisdom of this procedure seems to me to be questionable since the student is presented with a mass of material which is really rather dull and of whose significance he may be in doubt, before he comes to any real-life application. I should like to see this, admittedly vital, material in appendices. Also, I cannot share the author's predilection for vector diagrams.

A more serious criticism of the book is that the mathematics are poorly set out and printed. Equations are freely mixed with textual material and are never numbered. This means that the equations have to be rewritten to follow derivations and that little or no emphasis is given to important results.

Apart from these defects, the book is a sound introduction to the subject. Little attention is paid to more modern aspects of radio communication, such as f.m. and television, and the all-important topic of noise should be treated much more fully. However, there has been a strong need for a modern English book for use in universities and many teachers may feel that the existence of Mr. Lovering's book allows them to devote more lecture time to the newer parts of the subject.—A.H.B.

Introduction to Electromagnetic Engineering. By R. F. Harrington. Pp. 312; figs. McGraw-Hill Publishing Co., Ltd., 95, Farringdon Street, London, E.C.4. Price 62s.

This text is written as an introductory course in electromagnetic theory for students of electrical engineering at the junior, senior, or first-year graduate level who are already familiar with elementary circuit theory and the calculus. It is, apparently, designed for the first of several courses in electromagnetism taken by students in American colleges, and as such its scope is too restricted for use as a comprehensive text in British universities. The author's aim is to familiarise the student with field quantities and concepts, to teach the associated vector analysis and to show the use of the theory in solving some elementary problems. Rationalised M.K.S. units are used, and the greater part of the book is devoted to a study of static fields.

Field theory is developed from the "basic concepts" of circuit theory, an approach which no doubt has advantages for the engineering student provided these concepts are sound. Unfortunately in the present case this is not generally true. For example, the first sentence of the book states that the measurement of a quantity involves a *unit* and a *number*, but on p. 3 we find that electric charge is the quantity by which "amount" of electricity is measured, which is scarcely clear. "Voltage" is defined (p. 4) as the change in energy per unit positive charge associated with the transportation of the charge, and on p. 8 the "usual expression" of Kirchhoff's voltage [*sic*] law for circuits is said to be that the total voltage around a closed current-circuit is zero. Here "voltage" is clearly equivalent to potential difference, whereas the "usual" expression for Kirchhoff's second law of circuits is that the e.m.f. around a closed circuit is equal to the product of current and resistance. But on the same page the "voltage law" for circuits is generalised in the form "total voltage around a closed circuit equals the negative time-rate of change of linking magnetic flux," which equates "voltage" to electromotive force. The concept of e.m.f. is not, in fact, introduced at all, but on p. 42 the electric intensity, **E**, is defined as a vector *whose line-integral is voltage* which means that the "voltage" between the terminals of the stator winding of an alternator is the terminal p.d. V, if we take an external path and IR if we take a path through the winding, while the e.m.f. is not defined at all.

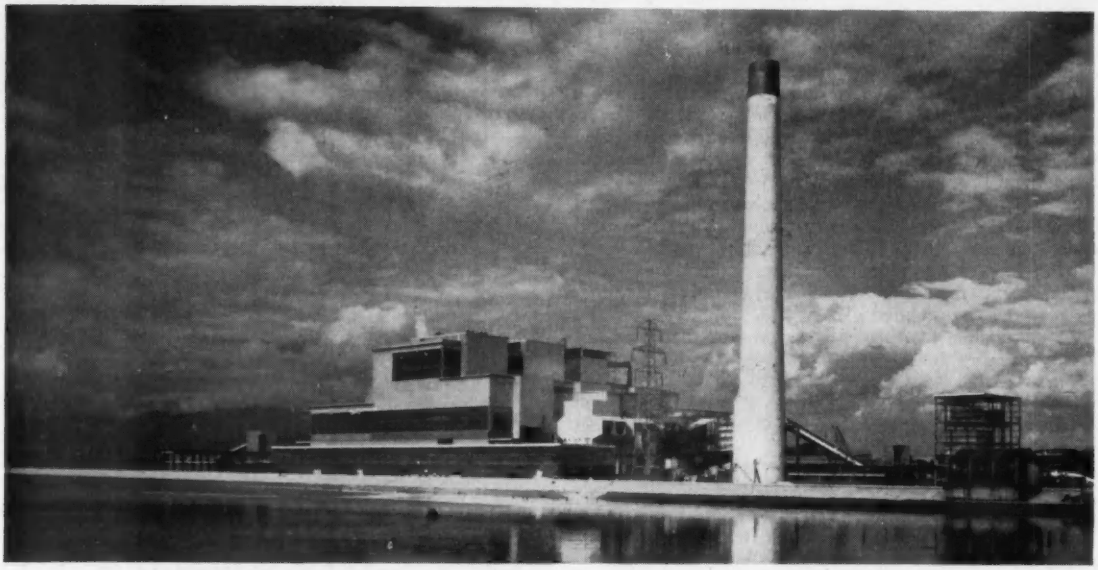
The later development of field theory, however, is happier, if rather tough going for the average junior-year student. Electric flux density is neatly defined as a vector having charge density as its *flow source* and magnetic intensity as a vector having total current density as its *vortex source*. We are introduced, at quite an early stage, to Maxwell's equations, followed by chapters on the fields of static charges and steady currents, in which the vector potential is used, and one on field concepts in which polarisation and magnetisation are defined. Since, in later chapters, the author stresses the symmetrical expression of electric and magnetic quantities, even to the inclusion of magnetic currents, it is perhaps surprising to find magnetisation defined as $\mathbf{M}=\mathbf{B}/\mu_0-\mathbf{H}$ whereas polarisation, as usual, is $\mathbf{P}=\mathbf{D}-\epsilon_0\mathbf{E}$.

Useful chapters on boundary problems and circuit elements are followed by a discussion of electromagnetic waves, Poynting's theorem, retarded potentials and an introduction to waveguides. This, with much use of vector analysis, is unusual in an introductory book which omits any treatment of fields which vary slowly with time, as in a.c. power circuits, and in which the law of electromagnetic induction is limited to the case of a closed stationary circuit.

Nevertheless, in spite of its limitations the book has merit. Each chapter includes a number of questions for discussion, which should keep the thoughtful student very busy, followed by many well-designed problems. The necessary vector analysis is clearly explained as occasion demands, with a summary in an appendix, but the general mathematical standard is such that the average British student of electrical engineering is not likely to derive much benefit before his final honours year.—E.G.C.

5 Anni del Museo. Pp. 198 (illus.) and index. Museo Nazionale della Scienza e della Tecnica Leonardo da Vinci, Milan.

This volume has been issued to commemorate the fifth anniversary of the Museum. It sets out an account of the origin and objects of the establishment and illustrates and describes some of the halls and principal exhibits. The latter include drawings and reproductions of devices invented by Leonardo da Vinci, early machines (Italian and foreign) and electrical apparatus, including examples of furnaces, automobiles, aircraft, etc.



Kincardine power station, where the first 120 MW set was commissioned in December

ELECTRICITY IN SOUTH SCOTLAND

BOARD'S FOURTH ANNUAL REPORT

DURING the year ended 31st December, 1958, the first 120 MW set was commissioned in Scotland at Kincardine power station. This station will have a total installed capacity of 760 MW, consisting of two 200 MW and three 120 MW units. This and other outstanding events are included in the annual report and accounts of the South of Scotland Electricity Board published last week.*

By agreement with the Corporation of Glasgow, the Transport Department's generating station at Pinkston, with an installed capacity of 65 MW, was taken over by the Board on 31st October. With the closing down of Ferguslie station, 16·25 MW of obsolete plant was taken out of commission while the output capacity of two existing stations was uprated by 8 MW. The maximum demand on the system was 1,627 MW, an increase of 7·2 per cent over the 1957 figure. At the time of this maximum demand (18th December, between 4.30 and 5 p.m.), 96·5 per cent of the Board's total power capacity was available. During the year, the Board generated 86·27 per cent of its requirements.

Reconstruction of Dalmarnock power station was completed during the year and work commenced on the extension of the Braehead station by the installation of a 60 MW turbo-alternator/boiler unit. Work is proceeding on Nos. 2 and 3 generators at Kincardine power station for commissioning in 1959 and 1960 respectively. These two units are of 120 MW capacity. Substantial progress was made on reactor A, the turbine housing and the foundations of the culverts for the circulating water system at Hunterston. The first half of this station is due for commissioning in 1961 and the remainder in 1962. Following the successful experiments on the handling and burning of washery slurry at Barony, the siting of a small slurry burning station in Fife is being considered.

The average thermal efficiency of the steam stations in the Board's area increased during the year from 25·94

Clydebank Service Centre

* H.M. Stationery Office, 4s.

to 26·07 per cent. The highest efficiency (30·81 per cent) was recorded at Portobello high pressure station.

The arrangement for the interchange of supplies with the North of Scotland Board and the Central Electricity Generating Board continued during 1958. The net import from the North of Scotland Board represented 5·8 per cent and from the C.E.G.B. 7 per cent of the South of Scotland Board's requirements.

A double-circuit 275 kV transmission line between Carlisle and Clyde's Mill was connected to the supergrid system in November. This is the first 275 kV transmission line to be commissioned in Scotland, although it had operated at 132 kV since 1954. Approval was given to the construction of a 275 kV double-circuit line from Kincardine to Abernethy to provide the necessary transmission capacity for supplies to be given to the North of Scotland Board at off-peak times.

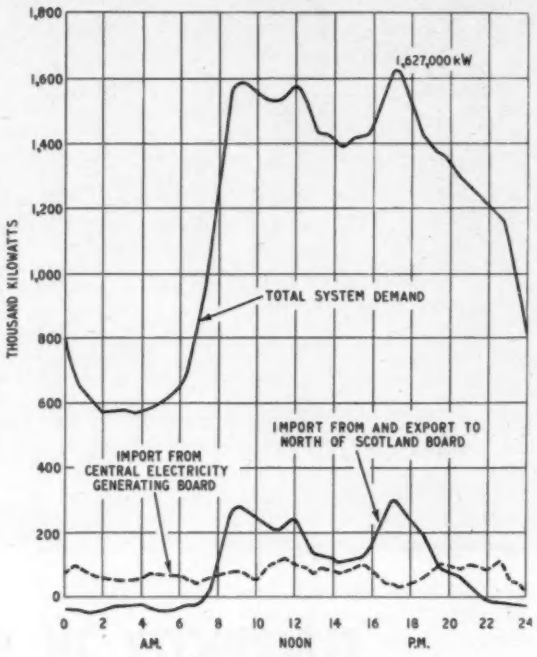
Extensions and reinforcements to the 132 kV system were accelerated during the year. To cater for the load growth of the Glasgow area, schemes to provide additional 33 kV supplies were approved. Work is well advanced on the 25 kV single-phase supplies required for stage 1 of the Glasgow suburban railway electrification scheme. This supply will be made available from four 132 kV supply points. The distribution system was reinforced and expanded to meet load growth, £3·9 million being expended under this head.

The adoption of live line maintenance techniques to enable repair work to be carried out on 11 kV rural lines without interruption to supplies is being investigated, and a centre has been established by the Board in the Dumfries and Galloway area to give the necessary training to linesmen.

High-speed automatic reclose circuit-breakers are being provided on rural lines. The speed of reclosure is such that the consumer does not experience any more than a momentary interruption of his supply.

In co-operation with manufacturers, applications of electro-heat to stress relieving and preheating of pressure vessels for welding were designed and carried to a successful conclusion. The use of warming cables was further developed for the protection from frost and snow of roads, footpaths and external stairways.

During the year there was an increase of 7·7 per cent in electricity sales to consumers over the corresponding figure for 1957. The recession in the heavy industries affected sales to industrial consumers, the increase being only 0·7 per cent on 1957. Many new supplies, however, were given to industrial premises, including a foundry with an 18 MVA steel melting furnace in Glasgow.



Variations in district demand on 18th December, 1958 (day of maximum demand)

Floor warming of domestic premises has been a feature in local authority housing development, the majority of the new flats being heated by this method. All-electric flats with floor warming installations now total 909, and an additional 2,000 are under construction. This type of heating is also being provided in privately built dwellings, large office blocks and other commercial buildings.

The system load factor shows steady improvement and the vigorous promotion of off-peak load development has contributed to this trend. In 1958 the off-peak development is estimated to have improved the system load factor from 44·6 to 45·8 per cent.

After meeting all expenses chargeable to revenue account, there was a surplus of £67,901. This has been added to the balance of the revenue brought forward to 1959, which now stands at £540,185. Income from the sale of electricity was £37 million, an increase of 8·16 per cent over 1957. The average price per kWh sold was 1·474d against 1·468d for the previous year. Capital expenditure totalled £27·62 million, £16·92 million of this being in respect of the

ELECTRICITY GENERATED AND PURCHASED

	Million kWh	Per cent of Total	Cost (£000)	Cost per kWh 1958 d	Cost per kWh 1957 d
Generation in South Scotland:					
At steam stations	5,490	81·96	19,311	0·844	0·826
At hydro stations	289	4·31	259	0·215	0·201
	5,779	86·27	19,570	0·813	0·791
Interchange:					
North of Scotland Board, net import	389	5·81	2,813	1·737	1·441
C.E.G.B., net import	468	6·99	1,207	0·619	0·718
Sundry purchases	62	0·93	196	0·755	0·672
Total delivered to system	6,698	100·00	23,786	0·852	0·827

INCOME AND SALES

Class of Consumer	Income 1958 (£000)	Income 1957 (£000)	Electricity Sales 1958 Million kWh	Electricity Sales 1957 Million kWh	Revenue/kWh 1958 d	Revenue/kWh 1957 d	Number of Consumers 1958	Number of Consumers 1957
Domestic	11,470	10,332	1,918	1,665	1·435	1·489	1,178,467	1,155,554
Farms	778	694	130	113	1·434	1·473	13,821	12,863
Commercial	6,610	5,920	924	814	1·717	1·746	117,590	116,642
Industrial	17,018	16,420	2,879	2,859	1·419	1·378	11,468	11,450
Public Lighting	819	655	119	111	1·658	1·418	141	140
Traction	102	—	20	—	1·256	—	1	1
TOTAL	36,798	34,021	5,990	5,562	1·474	1·468	1,321,488	1,296,650

Hunterston and Kincardine generating stations. This total was financed partly from external borrowings and partly from internal sources.

It was stated in last year's report that the point was being reached where, despite the expansion of electricity sales, present tariff levels could no longer provide sufficient revenue to meet growing costs. Tariff revisions were therefore made towards the end of 1958. At the revised tariff levels, the general prospect is that, with the continuing expansion of electricity sales, the year 1959 should produce satisfactory financial results, despite the heavy programme of capital development which the Board continued to face.

The document also contains the report of the Electricity Consultative Council for the South of Scotland District for the year ended 31st December last.

COMFORT IN LIGHTING

TO overcome the problem of glare when providing high levels of illumination the Research Laboratories of the General Electric Co., Ltd., have produced new designs of reflectors, louvres and diffusers for fluorescent tubes and mercury vapour lamps. These are combined in the company's "Comfort Lighting" range of commercial and industrial fittings and enable lighting installations to be designed which produce a general illumination level of up to 100 lm/sq ft or more without any discomfort from glare.

With industrial dispersive reflectors not only is glare obtained from the bare filament, but even when the filament is obscured the white enamel skirt of the reflector may still be disturbing. The new G.E.C. high-mounting units have a circular anodised aluminium specular reflector with a slightly diffusing finish designed to give a low brightness skirt. The reflector provides a bare lamp cut-off of 58 deg with a 250 W MBF/U lamp and 62 deg with a 400 W MBF/U lamp or 1,000 W MBF/V lamp.

Careful control of the contour has produced smooth light distribution and steps at the apex of the reflector prevent the production of a hot-spot on a surface immediately below the lamp. Ventilation slots allow air to pass over the reflecting surfaces, so as to retard the deposition of dirt. These slots also provide a certain amount of upward illumination to reduce tunnel-effect and ensure that the mains wiring entry chamber in the canopy is kept cool. An over-reflector on the canopy (or splash-guard in semi-exposed conditions) prevents dirt falling on the lamp from above.

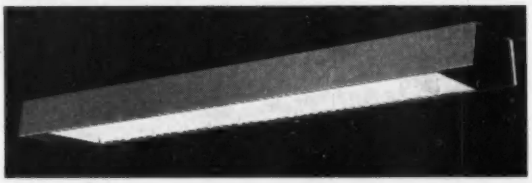
The unit for 250 or 400 W lamps is 16½in in diameter, 20in high and weighs 5½ lb. The 1,000 W unit is 20in in diameter, 23in high and weighs 7 lb. The prices are £7 13s and £11, respectively, including purchase tax.

"Comfort Lighting" unit to house an MBF lamp

In fluorescent fittings glare is obtained both from the bare tube and from the sides of the louvres. The new G.E.C. fittings have anodised aluminium reflectors and louvres with stepped surfaces. The reflector system provides a bare lamp cut-off of 55 deg measured from the downward vertical. Above this angle there is no light from the reflectors in the minor axis. In the major axis a cut-off of 63 deg is provided by the "Low-glo" louvres. Above this angle a low brightness is discerned.

The efficiency of the fittings in any installation is high since the light is directed rather more downward than in conventional designs from which the contributions from the distant fittings are often of little value because the light arrives at the working point at such low angles that it is easily shadowed. The fittings are designed for 5ft 80 W tubes and are available in twin or single tube models for recessed or pendant mounting, and with opaque or translucent sides.

A louvre plate of clear glass with hexagonal elements on its lower surface is also available. The elements direct the light in a controlled intensive distribution and act as louvres with an effective cut-off angle of 65 deg. The brightness of the panel is uniformly diffused up to an angle of 45 deg from the vertical with rapid diminution at higher angles. There is also a unidirectional louvre in which the anodised aluminium cross louvres are inclined at 15 deg to the vertical. This ensures low louvre brightness when viewed against the louvre angling and additional light in the opposite direction.



Single tube pendant fitting

These louvres are specially designed for drawing offices in which the occupants are all facing in one direction. The "Comfort Lighting" fluorescent fittings range in price from £16 to £26 16s.

New British Standards

A SPECIFICATION for isolators has just been published and supersedes the last part of the 1937 edition of British Standard 116. It specifies the performance of a range of indoor and outdoor oil- and air-break isolators. The voltage ratings extend from 415 V to 275 kV, and the current ratings from 200 A to 2,000 A with provision for higher current ratings. The isolators included are suitable for use at altitudes up to 3,300ft and in ambient temperatures not exceeding 40 deg C.

The foreword to the publication (B.S. 3078 : 1959) draws attention to the distinction between an isolator (which was no rated making or breaking capacity), a switch (which has rated making capacity), and a circuit-breaker (which has rated making and breaking capacity).

Part 2 of B.S. 2562 dealing with cable boxes for solid-type cables has just been published and extends the voltage range of the Standard to 33 kV. It gives details of seven cable boxes for use indoors and outdoors. Part 1 (issued in 1955) dealt with boxes for voltages up to and including 11 kV.

The Standard is applicable mainly to boxes for lead-covered cables, but account is taken of the use of cables with an aluminium sheath. Each box is completely identified by a shell number. In addition to establishing the basic dimensions necessary for interchangeability of boxes with the same shell number, the standard specifies dimensions of certain of the components. Wherever possible, components already standardised by the issue of Part 1 of the specification have been included in Part 2.

Copies of B.S. 3078:1959 (price 12s 6d) and B.S. 2562 Pt. 2:1959 (price 8s 6d) may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1.

Coal, Paper and Switchgear

THREE papers dealing with coal mining and electricity, electric drives in the paper industry, and standardisation and simplification of switchgear were presented at a joint meeting of the Utilisation Section and London Graduate and Student Section of the Institution of Electrical Engineers on 12th March.

Mr. A. P. Foster, B.Sc., Graduate I.E.E., in his paper "Coal Mining and Electricity" said that at the beginning of the century there was 160,000 h.p. installed below ground. Now a large colliery producing one million tons of coal a year might have a maximum demand of 5 to 6 MW and in the region of 20,000 h.p. installed, of which some 6,000 to 7,000 h.p. would be underground. The capital cost of the electrical equipment would probably be in the region of £750,000 to £1,000,000.

The number of uses for electrical power in coal mining was increasing, said Mr. Foster. For example, trolley locomotives had been installed and proved successful, radio for underground communication had been tried, and radioactive isotopes had been used for cage position indication and bunker content levels.

Opening the discussion, Mr. C. D. Wilkinson (National Coal Board) said it was unfortunate that out of roughly 1,100 locomotives used in coal mines, only one-third of them were of the battery type, the remainder being diesel locomotives. "We do not like using oil underground," he added. "We would rather use electricity, and we hope that where gradients are suitable, there will be a steady improvement in the use of electric locomotives."

In his paper "Electric Drives in the Paper Industry," Mr. P. D. House, B.Sc., Graduate I.E.E., discussed some of the drives involving an integrated scheme, and considered the requirements of the process and some methods of control. The requirements of the paper machine electric drive could, he said, be summarised as, first, power input at a number of independent sections, as many as 20 in number with some requiring up to 750 h.p.; secondly, accurate control of relative speeds or "draw" between adjacent sections; and thirdly, accurate control of the speed level of the machine as a whole.

The growing use of a closed-loop control system had opened the way to higher operating speeds with greater accuracy of control to meet the present-day demands for ever-increasing production in a highly capitalised industry.

Mr. A. C. G. Witts (Bowaters), who opened the discussion, said that the speed of paper machines was now three times as great as it was thirty years ago, and the power had increased some six times. It was reckoned that for the ordinary paper machine 6 to 7 MW was required, and that the whole of the equipment was worth somewhere between £4 and £5 million. Mr. Witts showed a number of photographs illustrating the evolution of the control gear.

During his lecture on "Standardisation and Simplification of Switchgear," Mr. M. J. L. Willison, Graduate I.E.E., showed a number of slides illustrating some of the ways in which the products of various manufacturers had been standardised, and how it had resulted in obvious manufacturing cost reductions.

A popular criticism, he said, was that standardisation entailed rigid uniformity which clashed with the freedom of action and thought, commonly associated with progressive design work. What was not always realised was that standardisation should only offer a temporary lull in the race to improve, and that the standard must be revised regularly to keep pace with technical progress. Rigid dimensional standardisation should only be employed where both users and manufacturers agreed that further development of that particular equipment was likely to be small. To be acceptable a standard must be suitable to the user's needs and practicable for the manufacturer. The work of standardisation would only be successful when both manufacturer and user were prepared to sacrifice a certain amount of ideal requirements to obtain a standardisation.

The need for more standardisation and simplification, and hence greater output with available manpower, had become of prime importance in competitive overseas trade.

In a contribution to the discussion, Mr. J. M. Ferguson (English Electric Co.) said that in an ideal state of affairs, one would start with a complete specification of the function that the switchgear had to fulfil. Then the switchgear designer was faced with developing his device to meet that specification; but it was difficult, because if he tried to design a device which embraced too wide a bracket on the specification, he would finish up with something which might be uncompetitive.

The suggestion was made by the author that the user should be prepared, in the interests of standardisation, to accept new designs; but it was difficult when an extension of a board was going in or when replacements were needed, which led to obsolete designs having to be maintained and manufactured.

The standardisation and simplification of switchgear could only be made effective by direct operation on the part of the designer. Standardisation organisations could do a great deal to co-ordinate and disseminate information, but the philosophy must be brought home directly to designers.

Leading the World

A NEW publication has been issued by the British Electrical and Allied Manufacturers' Association with the title "Leading the World." The achievements of the British electrical industry are recorded in "Serving the World" which was produced by B.E.A.M.A. for the Brussels Exhibition last year, and of which over 40,000 copies have been distributed overseas. The new publication is intended for distribution in this country and as the two publications are complementary they are being distributed together. About 10,000 copies of each are being issued to Members of Parliament and to people at the request of members of B.E.A.M.A.

"Leading the World" is divided into five sections. The industry's successful participation in the Brussels Exhibition is described and there is a complete record of the British Electrical Conference which was held at Brussels in May last. The British Section at the "Atoms for Peace" Exhibition held at Geneva is described and illustrated, and the importance of the industry's export achievements is emphasised, reference being made to the B.E.A.M.A. Catalogue and the *B.E.A.M.A. Journal* which play an important part in promoting export trade. The final section of the book contains an account of the Association's activities and a list of member-firms.

Plant Engineers' Conference

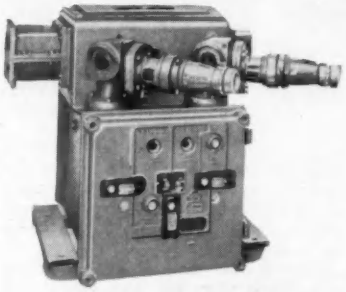
THE annual conference of the Institution of Plant Engineers will be held from 6th to 8th May at the Old Swan Hotel, Harrogate. Following the presidential address by Mr. W. M. Barber, two principal papers are to be presented and discussed. Mr. P. Mayne will give a paper on "Management in Plant Engineering," while Mr. J. Leyland will contribute "The Value of New Materials and Techniques in the Solution of Engineering Problems." There will also be group discussions on papers on "The Pros and Cons of Systematic Control and Planning in the Engineering Department," by Mr. G. A. Hutcheson, "Meeting the Requirements of the Clean Air Act," by Mr. D. C. Gunn, "Trends of Development in Factory Design and Equipment," by Mr. E. C. Stevens, and "Site Organisation and Cost Reduction," by Mr. L. McCarthy. At the conference dinner the principal speaker will be Sir Harry Pilkington.

NEW ELECTRICAL EQUIPMENT

Flameproof Drill Control Unit

The type SDU drill control unit added to the range of flameproof motor control gear manufactured by the BELMOS CO., LTD., Bellshill, Lanarkshire, is suitable for controlling one 3 h.p. drill or two 1½ h.p. drills from a.c. supply systems up to 650 V.

The housing consists of a welded steel case divided horizontally into two flameproof compartments, the upper containing a triple-pole isolating switch mechanically interlocked with the main compartment door. The transformer, contactors and associated protective and control mechanisms are housed in the lower compartment, mounted on a withdrawable chassis, and pilot test switches and earth



Belmos flameproof control unit

leakage relays are mounted on the door.

The contactor operating coils and low voltage transformer are supplied at 550 V from the primary winding of the three-phase 2·5 kVA transformer, and secondary windings supply the two drill circuits at 125 V. Two triple-pole a.c. operated contactors rated at 30 A are incorporated. Overload protection of the identical drill circuits is provided by two sets of two-pole overload coils in each contactor circuit, one set having single-rate time-lag action protecting the motor against overloads up to stalled current level, and the second operating instantaneously on fault currents up to short-circuit level. Earth leakage protection is provided by a current transformer tripping at 2 A, and lock-out protection ensures that the drill cannot be started until any earth fault is removed.

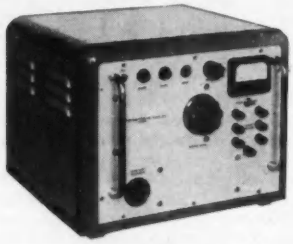
Transistor Tester

A transistor test set measuring the characteristics of low power transistors has been introduced by WINSTON ELECTRONICS, LTD., Shepperton, Middlesex. Complete data are obtained for both p-n-p and n-p-n transistors, the characteristics for the grounded base or grounded emitter condition being displayed. The current ranges cover transistors in medium power output stages and, when required, permanent records of the curves may be made by the employment of an oscilloscope camera over the cathode ray tube.

The unit, which is housed in a cabinet 4ft 7in high by 26in wide by 24in deep, is suitable for operation from a 200 to 250 V, 50/60 c/s supply, and requires only 750 W.

Low-Voltage Power Unit

The Electronics Division of the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, is now producing a transistor-stabilised power unit, type 10, designed for applications where a highly stable d.c. supply is required. With a nominal input of 230 V, 50 c/s, the unit produces an



G.E.C. power unit

output that can be varied continuously from 6 to 20 V with an output current up to 10 A. The voltage regulation between no load and full load is approximately 1·4 per cent, and at full load the peak-to-peak ripple is less than 2 mV.

A quick acting fuse, accessible from the outside of the front panel, provides protection against overloads, and a built-in meter measures in the ranges 0 to 20 V and 0 to 10 A d.c. The overall size of the power unit, which weighs 85 lb, is 17½in by 17¾in by 13in, and the price is £150 net, ex works.

Arc Furnace Electrodes

The range of graphite electrodes for electric arc furnaces manufactured by BRITISH ACHESON ELECTRODES, LTD., Wincobank, Sheffield, has been extended by the addition of large diameter taper jointed electrodes.

Acheson graphite electrode

Two electrodes have been introduced, of 16 and 14in diameter, supplementing the existing 20in diameter version. The 16in electrode has a nipple with a major diameter of 8¾in and length of 12in, while the 14in electrode is machined to take a nipple 8in at the major diameter and 10in long.

Four threads per inch, machined to fine tolerances, are provided on the 1 in 6 tapering surfaces. A 12in diameter electrode will be produced shortly.

Photomultiplier Tubes

A range of eight photomultiplier tubes for scintillation counting and other industrial applications is available from MULLARD, LTD., Mullard House, Torrington Place, London, W.C.1. One 15-stage, five 11-stage and two 10-stage tubes are being manufactured, all having maximum spectral response in the blue/violet region, from 4,000 to 4,200 deg A, and, in addition, two are fitted with quartz windows to allow adequate response to ultra-violet radiation. The tubes are designed for end-on viewing and have caesium-antimony photocathodes, ranging from 20 to 111 mm in useful diameter, with optically flat and parallel surfaces.

Clothes Dryer

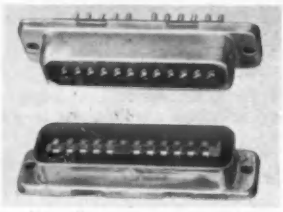
The clothes dryer and airer produced by PLOWDRY, Pontyrhyl, nr. Bridgend, Glam., can be mounted on a wall at any convenient height and, in addition, it is also designed to serve as a plate warmer. Basically it consists

Plowdry wall mounting clothes dryer

of a chromium plated tubular metal frame, measuring 22in square, which supports a metal casing containing a 1 kW black heat element. A wire mesh framework protects the clothes from coming in contact with the element. The smaller 6-rung framework, used for hanging the clothes to be dried, measures 22in by 15in and folds flat when not in use. The price, including purchase tax, is £4 19s 6d.

Miniature Connectors

The "Modac" range of connectors produced by the contact connectors division of MODERN ACOUSTICS, LTD., Manor Way, Boreham Wood, Herts., has been extended by the introduction of two miniature connectors, 23- or



"Modac" miniature connectors

13-way, for use in computers and other electronic installations. Both connectors are polarised, and each contact is capable of carrying up to 10 A at a maximum of 250 V.

Cable Glands

Three ranges of glands catering for all types of cables have been introduced by the COMBINATION METALLIC PACKING CO. (1921), LTD., Glasshouse Street, St. Peters, Newcastle-upon-Tyne, 6. These glands have been developed to produce the technical equal of the wiped gland at a favourable cost and without requiring skilled labour in assembly. No loose packing is required, and it is impossible to omit any essential parts since all the parts are visible after assembly.

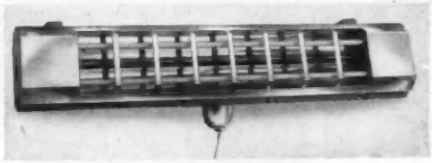
Type P.L.A. gland

The three-part type P.L.A. gland is suitable for p.v.c. or lead covered cables with armour. A fused-in lead lining is incorporated to enable a range of sizes to be produced which will accommodate every size of cable. The crimp obtainable at the coned end of item 1 (see illustration) is almost parallel and extends for at least $\frac{3}{16}$in. This has the effect of producing a perfect electrical bond when used in conjunction with lead covered cables and a water-pressure-tight seal. The gland can be fitted by screwing item 2 to item 1 until the two hexagon faces are perfectly mated together. The armour wires are accommodated between items 2 and 3, and there is no necessity for fitting expandable metal rings over the armour wires before locking item 3.

The P.L. range of glands is suitable for p.v.c. or lead sheathed cables without armour, and the A.R.M. range for any type of cable where it is necessary to make a perfect armour lock without requiring a water-tight seal.

Industrial Infra-red Heater

A built-in pull cord switch incorporated in the "Infrasol" model A3 infra-red industrial heater operates only one of the two 350 W, 500 W or



Grimwood "Infrasol" two-heat infra-red industrial heater

750 W elements, thus acting as a two-heat control. The unit, manufactured by GRIMWOOD (CROYDON), LTD., 59-65, Cross Road, East Croydon, Surrey, is intended for ceiling mounting, the brackets being designed to permit hanging in a wide range of positions. It is stove enamelled in silver grey, with an anodised silver guard, and the price is £7.

The single element domestic and industrial heaters are also now available with built-in double-pole cord switches, price £4 10s each, plus 19s 6d purchase tax in the United Kingdom on domestic models.

Nylon Chain

GEORGE GOODMAN, LTD., Robin Hood Lane, Birmingham, 28, are supplying nylon chain having low inertia and requiring no lubrication. Suitable for light positive drive applications, it is non-magnetic, with good electrical insulating properties, and offers a high resistance to chemical attack.

At present 8 mm pitch chain only is available. This will sustain a static load of 5 lb, but for continuous or rapidly intermittent operations giving rise to pulsating loads it is recommended that the driving load should not exceed 3 lb. Other sizes will be added to the range in due course.

School Lighting Fitting

A new acrylic shade fitting (Cat. No. HN/0200) for use with either a 150 or 200 W lamp has been introduced by ATLAS LIGHTING, LTD., 233, Shaftesbury Avenue, London, W.C.2. It is designed primarily for school lighting, yet its pleasing shape and performance make it ideal for use in offices, shops, etc. A metal gallery and spider, finished in matt black, enhance the appearance of the opal shade and offer quick, easy maintenance. The shade is instantly removable for cleaning without disturbing the lamp, and alternative fixing posi-

Atlas HN/0200 lighting fitting

tions are provided on the gallery for the different lamp sizes. The price of the shade, complete with gallery and spider, is £1 12s plus 7s purchase tax in this country.

Special rod, cable and close ceiling suspension sets for the fitting are available.

Electric Drill

A new ¼in electric drill, a successor to the "Cub" power tool, has been introduced by WOLF ELECTRIC TOOLS, LTD., Pioneer Works, Hanger Lane, London, W.5. Known as the "Cub-

Wolf "Cubmaster" ¼in electric drill

master," it is fitted with a higher powered motor than the previous model, giving an improved performance together with increased running speeds. A ¼in geared chuck is also fitted as standard equipment and the unit can be used with all existing "Cub" attachments without adaptation. On full load it has an input of 250 W and the spindle speed is 1,900 r.p.m.

The overall length is 7¾in and the net weight 3 lb. Models are available for all standard voltages and the price, complete with built-in TV suppressor, ¼in chuck, chuck key and 5ft of 3-core cable, is £6 19s 6d.

GENERATION and DEVELOPMENT

Domestic Appliance Sales

The high level of domestic appliance sales was maintained in January, wash boilers being again the only item showing a decrease in the list issued by the Electricity Council. The figures given in the accompanying table are confined to sales by the twelve Area Boards in England and Wales and thus represent only a part of the total sales throughout the country.

ELECTRICAL APPLIANCE SALES BY AREA BOARDS

	Sales in month ended 31st January		Sales in 12 months ended 31st January	
	Total	% change compared with Jan., 1958	Total	% change over corresponding period of previous year
Cookers	22,352	+ 45·2	269,996	+ 17·7
Water Heaters—				
Immersion	7,226	+ 14·6	164,982	+ 17·0
Storage	4,500	+ 38·8	50,525	+ 21·3
Wash Boilers	5,854	− 7·2	80,263	− 0·7
Washing Machines	15,947	+ 182·5	114,140	+ 56·1
Refrigerators	3,809	+ 203·5	77,736	+ 55·9

Revised Y.E.B. Tariffs

The Yorkshire Electricity Board's block tariffs have been amended by increasing the price per kWh in the first block, while reducing the number of kWh in intermediate blocks and also reducing the price per kWh in the final block. In the case of two-part tariffs, the maximum demand components are increased in price while the "unit" prices have been reduced. In a statement on the changes, the chairman, Mr. D. Bellamy, explains that it is only the small *electricity* consumer who will pay more initially —not necessarily consumers in the smaller properties. An average domestic consumer in a five-roomed house (representing the largest group of domestic consumers in the area) will pay 2s 6d more per quarter in the first block but in the next block the consumption at 1d per kWh is reduced from 750 to 450 kWh per quarter, the balance being charged at 0·8d per kWh, a saving of 5s; moreover, all additional consumption is charged at the reduced figure of 0·8d.

Further concessions are also made for restricted-hour supplies to all classes of consumers.

Inspection of Consumers' Installations

The chief commercial officer of the East Midlands Electricity Board, Mr. T. G. Blayney, informed the Electricity Consultative Council at its meeting at Nottingham on 4th March that standard instructions for the testing and inspection of consumers' installations before connection to the supply had been issued to the Board's installation inspectors. The instructions provided for a general examination of the installations. Where the supply to premises had been disconnected for more than three months, the full range of tests and inspections would be carried out before the installation was reconnected. If attention to the installation was found to be necessary, the consumer would be advised in writing, but the connection would be made unless it was unsafe to do so. Consumers were recommended to have their installations carried out by contractors who would execute the work in a competent manner. A list of contractors on the Roll of the National Inspection Council was available to the public for inspection at each of the Board's Service Centres.

Electricity in Angus

Electricity was introduced to the upper part of Glen Cova, Angus, on 11th March when the Countess of Airlie, at an electrical exhibition in Clova Hall organised by the North of Scotland Hydro-Electric Board, pressed a button to take power as far up the glen as Glen Doll Hostel. Lady Airlie, who had been introduced by Mr. R. B. Anderson, area manager, was presented, on behalf of the Board, with a convector heater.

The Earl of Airlie, past chairman of the Board, said the people of the glen would be grateful to the Board for its enterprise.

Off-Peak Tariffs

Commenting on a suggestion that the Eastern Electricity Board's new off-peak tariffs were of little use to domestic consumers, Mr. R. H. M. Barkham, the Board's chief commercial officer, said that they were tariffs for the future and would be of great benefit to people who were installing electric floor warming in new houses and in blocks of flats. It was not claimed that domestic consumers at present using electricity on the existing tariffs would gain very much by changing over. What the Board wanted to do was to get people to regard the heating of their houses as a distinct and separate use of electricity for which both a special circuit and a special tariff were necessary. Asked if he thought there would be a considerable swing over to under-floor and storage heating in the foreseeable future, Mr. Barkham replied that he thought there must be in view of the Clean Air Act.

Cookers for the Blind

New cookers specially adapted for use by blind persons are to be made available by the Eastern Electricity Board at a rental of less than 2s 6d a week.

Finchley Change-over

The last d.c. consumer in North Finchley was switched over to a.c. recently when Mr. S. J. Butler, manager of the Advance Laundries, stopped the convertor in Ballards Lane. The change-over marks the completion of work begun in 1937.

Refrigerator Hire-Purchase Terms

That refrigerators were just as essential as cookers and should be available on equal terms was the view expressed by one of the members of the London Electricity Consultative Council when this matter was discussed last week. In the case of refrigerators, the repayment period is three years compared with five years for cookers and this point was taken up with the Board after the previous meeting of the Council. In reply, the Board's secretary said it was thought that the terms for refrigerators were, in fact, very favourable. The Board was anxious to offer consumers the most reasonable terms in all cases but having regard to the limited finance available it was unable to extend the period of repayment.

The chairman (Sir Isaac Hayward) explained that the various Boards endeavoured to work to a common policy in the matter of hire-purchase, and there was an understanding between them with regard to the terms offered.

After some discussion a resolution was passed recording dissatisfaction with the Board's reply and expressing the hope that when the terms were next reconsidered note would be taken of the members' views.

North Wales Nuclear Power Station Sites

The Caernarvonshire Executive Committee of the Council for the Preservation of Rural Wales, which is opposed to the building of a nuclear power station at Edern, in the Lleyn peninsula, has welcomed the Central Electricity Generating Board's plan to investigate five areas on the northern coast of Anglesey as alternative or additional sites (see *Electrical Review*, 27th February, page 413). The secretary (Mr. W. Twiston-Davies) said that Anglesey was a county which had not been scheduled as an area of outstand-

ing beauty. In the present experimental stage it seemed quite wrong to place a station in the Lleyn peninsula before the Board had fully investigated other sites. The Committee hoped that before the Edern project was approved progress would have been made in technical knowledge which would redeem the national parks from the necessity of having industrial works installed in scheduled areas.

All-Electric Flats

As part of a redevelopment scheme, a £200,000 contract has been awarded to George Wimpey & Co., Ltd., for the erection of two multi-storey blocks of all-electric flats at Pomarium Street, Perth. Space heating in living rooms and halls will be by electrical floor warming, and there will be points for electric fires. Water will also be electrically heated.

Barrowford (near Burnley) U.D.C. proposes to build 24 flats equipped with electric floor heating. The living rooms of the flats will have a small fireplace fitted with an electric fire if the occupants wish to supplement the floor heating.

Atomic Power in Ulster

The Northern Ireland House of Commons on 25th February approved a supplementary estimate of £37,900 for expenses incurred by the Electricity Board on tests to determine the suitability of sites on the western shores of Lough Neagh for the erection of a nuclear power station. The Minister of Commerce (Lord Glentoran) said it had already been explained that, following the "fall-out" at Windscale, the advice given to the Government by experts in this matter had changed and it had been decided to seek a coastal site for Ulster's nuclear power station. Lough Neagh might be used as a source of drinking water and it was inadvisable at present to proceed to erect an atomic station there. The site was a good one, however, and might be considered in years to come.

OVERSEAS

Harnessing the Indian Ocean

A British colony since 1810, Mauritius, in the Indian Ocean, has very little industry and a population of 500,000 to support. Realising that a cheap supply of electricity would completely transform the position, it has recently considered a plan, ambitious but feasible, to use the tidal forces to this end. The scheme, put forward by the general manager of the Central Electricity Board, Mr. A. N. Bott, envisages the creation of a number of water-basins extending from Souillac to Rivière de Galets, and the construction of the necessary dams, canals, pipelines, and power stations.

Both the technical and economic problems have been worked out in some detail, and it is hoped, after the blessing of the civil, mechanical and electrical consultants has been received, to initiate a pilot scheme at a relatively small cost. If successful, the whole project would go forward—starting in 1960, and proceeding by stages until complete in fifteen years or so.

In the island there is a consensus of opinion in favour of financing the pilot scheme with a view to acquiring technical data. But, since Mauritius has already embarked on a five year plan involving heavy outlay, foreign capital would be required to enable the major construction to go ahead. An editorial in the newspaper *Advance* has suggested an approach to the Commonwealth countries for financial aid. Granted such assistance, the Bott plan might well enter the sphere of practical politics—and, as well as giving a tremendous boost to the economy of this remote island, offer opportunities to British exporters.

Eire Not to Buy Atomic Reactor

Mr. de Valera said in the Dail on 5th March that the recommendations contained in the report of the Atomic Energy Committee had been examined by the departments concerned and had been considered by the Government. The recommendations made by the committee in relation to the application of radiation and radioactive isotopes to agriculture had, in general, been accepted. The Government had decided, however, that in present circumstances, no action should be taken to acquire a research reactor.

Mr. Liam Cosgrave asked what were the circumstances that made it undesirable to secure a reactor at the moment.

Mr. de Valera said it would not be feasible because of the cost. Changes were taking place, and at present there was no immediate need for a reactor.

Peace River Project

Sir Andrew MacTaggart, chairman of the Peace River Power Development Company, said at a Press conference in Vancouver recently that design work was being started on the first dam for the 4,000,000 h.p. Peace River power project. It was announced that three more British firms had between them bought over 750,000 shares of the company. They are John Laing & Son (Holdings), Taylor Woodrow (Overseas), Ltd., and Close Bros., Ltd., all of London. To date, 2,500,000 shares have been purchased at $1 per share. British Insulated Callender's Cables, Ltd., holds 200,000 shares.

New Hydro Project for Nigeria?

The Electricity Corporation of Nigeria has commissioned Messrs. Balfour, Beatty & Co., Ltd., to investigate the River Niger in the vicinity of Jebba with a view to the construction of a hydro-electric project in the near future. Reporting this, Barclays Bank D.C.O. states that the project is in anticipation of Nigeria's need to develop secondary industries for which a plentiful supply of cheap electric power is necessary.

Sales of electricity in Nigeria for the nine months ended 31st December, 1958, amounted to 182 million kWh, producing an income of £2,789,000. This represents a growth, by comparison with the corresponding period of the previous year, of 28·5 per cent in terms of consumption and 23·9 per cent in terms of income.

Geothermal Power Developments

A correspondent reports that the New Zealand Minister for Works (Mr. Watt) recently announced that the British Thomson-Houston Co., Ltd., has been awarded a contract worth almost £2 million for the supply of geothermal steam generating plant for Wairakei. He said that the machines would include one 11 MW and two 30 MW generators for Stage 2 and two additional machines, one of 11 MW for high-pressure steam and one of 30 MW for mixed pressure. At the completion of Stage 2 Wairakei would have a generating capacity of 150 MW. Mr. Watt said the extra machines were being provided in accordance with the policy announced in the White Paper on power development and would enable an output of 100 per cent to be achieved instead of 85 per cent as previously planned. Stage 3 would include the use of hot water as well as high and low pressure steam, and work would shortly begin on a pilot plant.

Nuclear Power in Brazil

Representatives of Mitchell Engineering, Ltd., have been discussing projects for nuclear power stations with the authorities of several States in Brazil. According to the *Fortnightly Review* of the Bank of London & South America, the State of Paraná has already contracted the services of the company and the discussions with the States of Sao Paulo and Rio Grande do Sul are well advanced. Commenting on the proposal to build a 20-30 MW nuclear power station in the north of the State of Rio de Janeiro, the State Secretary for Electric Power said it was satisfactory to note that the United Kingdom could supply a pioneer nuclear plant within a period of thirty months.

Power Development in India

We have been sent a copy of the December, 1958, issue of the *Indian Journal of Power and River Development*, which contains all the papers read at a symposium on "Power Development in India." The conference was held under the auspices of the Indian Science Congress at Delhi. Although the papers dealt mainly with the supply industry in India, ranging from e.h.v. transmission to plans for power generation, there were a number of points of general interest. Tests on a 220 kV transmission line were described and one paper surveyed the trends in the design of axial flow units.

PARLIAMENTARY REPORT

Navigational Aid Systems

In the House of Lords Lord Stoneham asked the Government if they were aware that the recommendation of the International Civil Aviation Organisation to the effect that the obsolete American V.O.R. system should be adopted as standard navigation aid for the world's air liners would bring an arbitrary increase in American sales at the expense of superior British equipment.

Lord Gosford, Under Secretary, Foreign Office, said the Government were aware of this implication, but V.O.R. was a useful navigation aid under many conditions and was by no means obsolete. The conference decided to recommend V.O.R., with the addition of a distance-measuring equipment known as D.M.E.T. The British delegation reserved the British Government's position on D.M.E.T. and withdrew its proposal for the adoption of the Decca system as a protest because the conference had not based its considerations on sound and objective technical grounds. The Government would press, in the Council of I.C.A.O., for a more satisfactory solution. Present standards of safety in congested air space could not be maintained with V.O.R./D.M.E.T. without seriously reducing the efficiency of air traffic control. In the meantime the further development and evaluation of the Mark X Decca system would continue.

Electrical Safety Regulations

During the committee proceedings on the Factories Bill, Mr. Arthur Palmer proposed an amendment that the Minister of Labour should at least once every five years review any special safety regulations made relating to electricity and bring them up to date and, in doing so, should consult the Minister of Power. He called attention to the great growth of electrical systems in recent years. There had been a vast increase in voltages and especially in possible short-circuit energy which could be released under fault conditions. The 1937 Factories Act was the principal measure, but Regulations on electrical safety were drawn up as long ago as before the 1914-18 war, and the major Regulations were still substantially the same as those drawn up in 1908. He gave examples of out-of-date definitions in the Regulations.

A great deal of attention was given to the need for the circuit-breaker to be properly insulated and to be capable of making and breaking the normal operating current, but not enough was said about the importance of the breaker being able to deal with a very heavy fault, of the order normally met with today, without exploding and perhaps killing the operator. In the course of the last reportable year he believed eight people lost their lives because of explosions connected with circuit-breakers. During 1957 there were 687 reportable electrical accidents, of which 32 were fatal. The Factory Inspector reported: "This total is lower than in recent years but the proportions arising from different causes have not changed significantly. In comparison with industrial accidents generally, the fatal rate is high."

At the moment there seemed to be no legal provision to compel Electricity Boards under penalty to remove circuit switches either from power stations or substations, said Mr. Palmer. This was an anomaly and a curious contrast with the Bill's provisions dealing with safety regulations for boilers.

Divided Responsibility

He submitted that the entire responsibility for safety of electrical systems should be transferred to the Minister of Labour. Conditions relating to generation already came under him, but on the electrical system the responsibility for making regulations was with the Minister of Power. This legislative division had existed since the time of the Electricity Commissioners. The position with regard to industrial supplies to factories was particularly complicated. Regulations on the incoming side were the responsibility ultimately of the Minister of Power, but, inside the factory, it was left to the Minister of Labour and there had been a number of instances of lack of proper maintenance of switchgear, transformers and so on in factories, with consequent mishaps.

The Boards had their own domestic safety regulations for generation, transmission and distribution, but it was his view—and the view of others in the industry—that there were a number of provisions in the domestic regulations which should be given statutory force when the Electrical Regulations were revised. "There is an area of doubt on what is the legal responsibility of an engineer or workman in a power station or large substation," Mr. Palmer added, "because in a general sense he is working under the Factories Act, but in the more particular sense he is working under the domestic code of safety which has not the force of law."

Replying for the Government, Mr. Richard Wood, Parliamentary Secretary, Ministry of Labour, said that in correspondence with Mr. Palmer he had pointed out the difficulties of producing a comprehensive safety code. Naturally, the Government agreed on the increasing importance in the electrical industry but the trend in accidents in it did not bear out the suggestion that there was any great deficiency in the Regulations, which were last amended and strengthened in 1944. As for the definitions, the effect of them—although they might suggest the Regulations were a little out of date—had been to provide increased protection.

A review fixed every five years might mean that it would be a rather perfunctory affair. In fact, the Regulations were under review the whole time in the light of expert advice that the Ministry received from all quarters, including particularly the Electrical Branch of the Factory Inspectorate. He said he would give an undertaking that when the Minister of Labour was re-framing Regulations he would consult with the Minister of Power, the British Employers' Confederation, and the Trades Union Congress, and any expert authority who had advice or views to offer.

Mr. Wood pointed out that since 1930 the use of electricity in industry had increased by six times, but the number of accidents had less than doubled in number.

Mr. Palmer replied that although this was true, the accident rate remained high and it was not something which Parliament should view with complacency. He regretted that there had been no answer to his argument about divided responsibility.

The amendment was withdrawn.

Borrowing Powers Bill

The Electricity (Borrowing Powers) Bill passed the committee stage in the Lords without amendment.

Nuclear Propulsion

During the debate on the Navy Estimates, Mr. Orr-Ewing, Parliamentary Secretary, Admiralty, said that negotiations had been concluded between the chosen firms, Rolls Royce, Ltd., and the Westinghouse Electric Corporation, for the *Dreadnought* atomic propulsion unit. Under the contract, a complete set of machinery similar to that being installed in the latest U.S.N. submarines of the *Skipjack* class would be obtained from Westinghouse. It was planned to lay the keel this summer.

Anglo-Russian Trade

Mr. J. B. Scott (Crompton Parkinson, Ltd.), as chairman of the Russian Section of the London Chamber of Commerce, led a delegation from Industrial & Trade Fairs, Ltd., and British Chambers of Commerce on a visit to Russia. Upon the delegation's return last week Mr. Scott announced that it had been agreed to stage reciprocal trade fairs in 1961—a British one in Moscow and a Russian one in London.

Mr. Scott also said that a transformer contract had been secured for Crompton Parkinson. Mr. G. H. Jolley (Metropolitan-Vickers), another member of the delegation, received a number of inquiries regarding power station equipment.

INDUSTRIAL NEWS

Argentine Hydro-Electric Contracts

The Argentine Government is reported to be placing a contract with a consortium of thirteen Italian, twelve French and two British concerns for the construction of a large dam at Chocon, on the Limay River in Northern Patagonia, and a hydro-electric plant with an ultimate capacity of 650 MW, in stages. The total cost is put at about £45 million. The two British companies in the consortium are the English Electric Co. and British Insulated Callender's Construction Co.

Pacification at Hunterston

Arising out of the threat of the Motherwell Bridge & Engineering Co. to withdraw from its Hunterston (Ayrshire) nuclear power station contract, a meeting of the company's management and shop stewards was held on the site on 12th March. After the meeting a joint statement was made that agreement had been reached on the procedure for dealing with disputes and that a joint production committee was to be set up. The company's threat of withdrawal was the result of continual unofficial strikes.

Water-Heating Campaign

As part of a campaign for electric water-heating promotion, A.E.I.-Hotpoint, Ltd., is introducing to Electricity Boards, retailers and contractors during this month new point-of-sale material. This includes a set of five well-produced illustrated leaflets covering immersion heaters, thermostats and their accessories; the two-purpose "Twimerser"; and a variety of storage heaters.

In addition the company is offering display pieces on loan for special water-heating weeks and other promotional events. One of these, a five-panel set, is shown in the accompanying picture. It emphasises the simplicity of installing a Hotpoint hot water system, the advantages of lagging and the economy of the "Twimerser."

Display piece produced by A.E.I.-Hotpoint, Ltd., in connection with its water-heating campaign

Telephone Network for Jordan

A complete automatic telephone exchange system with automatic dialling between exchanges and equipment for trunk working to other areas of the country is to be supplied by Siemens Edison Swan, Ltd., for installation in the Jerusalem area of Jordan. The new exchanges will serve over 3,000 subscribers and provision is made for extension to more than 20,000. The cities concerned are Jerusalem, Ramallah, Jericho and Bethlehem, and the total value of the contract is in the region of £150,000.

Booklet of Abbreviations

The new enlarged edition of B.E.A.M.A. Publication 159 provides a selected list of over 400 abbreviations of qualifications, and British, international and foreign organisations thought likely to be met by people working in the electrical and allied industries. The addresses of the British organisations are given. Copies of the booklet can be obtained from the British Electrical and Allied Manufacturers' Association, 36, Kingsway, London, W.C.2, price 1s 6d each; 20 for £1; and 100 for £4, all post paid.

Machinery Merchants' Association

A luncheon and general meeting of members and firms interested in membership of the Association of British Machinery Merchants will be held at the Waldorf Hotel, Aldwych, London, W.C.2, on 24th March. At the meeting incorporation of the organisation as a company limited by guarantee, future policy and development will be discussed. To avoid any possible conflict with existing organisations with similar sounding names, the members will be recommended to seek incorporation under the title the Association of Industrial Machinery Merchants with the liability of the members being limited by guarantee. Firms interested in attending the luncheon and meeting should notify Mr. C. W. Allen, secretary of the Association, 100, Park Street, Grosvenor Square, London, W.1 (telephone: Mayfair 7086).

Microwave Telecommunications Contract

One of the largest single contracts for a microwave network in Europe, valued at approximately £750,000, has been placed with Standard Telephones & Cables, Ltd., by the Royal Board of Swedish Telecommunications. It provides for a propagation survey of the proposed routes to determine suitable sites for the equipment stations, and for the supply and installation of microwave equipment for operation in the 4,000 Mc/s band. Stations at Sundsvall and Boden will be linked to form an extensive network for the transmission of telephone and television signals.

Industrial Film Festival

The Second Festival of Films in the Service of Industry will be opened at Harrogate on 21st April by Lord Chandos, with the president, Lord Godber, presiding. On 24th April the awards will be presented at the festival dinner, at the Majestic Hotel, where the principal guest speaker will be Viscount Monckton. An exhibition of equipment and services at which many prominent manufacturers have taken stand-space will be open in the promenades and annexe to the Royal Hall, throughout the festival. With the success of the first festival in October, 1957, it was felt that the festival organisation should be put on a more formal basis to permit the organisation of future festivals. It was agreed that an association should be formed and at a recent meeting of the Festival Council the constitution of the new body was approved. Steps are now being taken to incorporate the association as a registered company limited by guarantee in the title of "Festivals of Films for Industry, Ltd."

N.I.C. at Bristol

The need to protect the public from faulty electrical installations and fittings was emphasised by Mr. A. N. Irens, chairman of the South Western Electricity Board, when he presided at a meeting sponsored by the National Inspection Council for Electrical

Left to right: Mr. E. J. Sutton, Brigadier W. G. S. Thompson, Mr. A. N. Irens and Mr. A. Plummer (chairman, N.I.C.) at the Bristol meeting

Installation Contracting in Bristol on 9th March. Addressing an audience of about 150 West Country industrialists, architects, contractors, municipal engineers and surveyors, Mr. Irens said that there was not a law about the hallmark of electrical work, but there was a growing realisation in all spheres, public and private, of the work the National Inspection Council was doing and the way it could help to set up a hallmark for work carried out by electrical contractors.

Brigadier W. G. S. Thompson, secretary of the Council, said that there was nothing to stop anyone setting up as an electrical contractor and there was very little check on what was done and how it was done. The Council's aim was to combat this by a Roll of Approved Contractors. The Council's inspectors examined the work of these contractors at least once a year to ensure that their workmanship and supervision were up to standard. The Inspection Council's chief technical officer, Mr. E. J. Sutton, told the meeting that out of the average of 300 applications a year for enrolment only 10 per cent were initially accepted. The rest were deferred and told by the Council where their work could be improved.

Cartridge Fuse Dispenser

Nettle Accessories, Ltd., Warren Street, Stockport, Ches., has introduced a carton containing 24 cards of new cartridge fuse dispensers. Each card contains four cartridge fuses (2 A, 5 A, 10 A and 13 A) packed in a special dispenser which enables a single fuse to be ejected as required; the front of the card states the correct fusing required by various appliances.

Orders for W. H. Allen

W. H. Allen, Sons & Co., Ltd., Bedford, have received a contract from the United Kingdom Atomic Energy Authority for the supply of two diesel engine-driven generator sets. These sets will provide standby supply to essential services for the advanced gas-cooled reactor at Windscale. The plant consists of two 12-cylinder, vee-form, pressure-charged, type VBS12 engines each running at 600 r.p.m. and driving a 600 kW, 240 V d.c. generator. Each set will be arranged for fully-automatic starting in the event of a failure of the mains supply.

The company has also received an order for Allen-Stoeckicht epicyclic main propulsion gears for use in the new 3,810-ton Australia - Tasmania vehicle ferry which is to be built in Australia for the Australian National Line. Each gear unit will be of the double-reduction type incorporating two epicyclic gear trains and main thrust bearing, designed to transmit 2,030 s.h.p., with a speed reduction of from 1,580 to 175 r.p.m. The gears, which will be manufactured at the company's gearing centre at Pershore, Worcestershire, are being supplied to the order of D. Napier & Son, Ltd., whose lightweight Deltic diesels will provide the main propulsion drive.

Silicon Rectifier for India

The Travancore Cochin Chemical Co., India, has recently awarded an order for 27,500 A 120 V rectifier equipment to the Westinghouse Brake & Signal Co., Ltd. Silicon diodes, made in the Chippenham Works, will be used, and water cooling has been chosen as preferable, the diodes being mounted on heavy copper bars which are cooled by distilled water recirculated through a heat exchanger to river water. The contract covers the a.c. circuit-breaker for the 22 kV input, a regulator, a step-down transformer, the rectifier cubicle and the control panel which utilises automatic constant current control. The Westinghouse Co. is constructing several other rectifier equipments for chlorine and hydrogen production, using silicon or germanium; the output of those installed and on order now totals 8·5 MW, whilst there are several selenium plants also in operation.

British Plastics Year Book

The 1959 edition of the "British Plastics Year Book" has been thoroughly revised and is now divided into nine sections. These include a section giving technical terms, plastics properties, new companies registered in 1958 and specifications. There are three sections devoted to classified lists of manufacturers and suppliers of materials, finished products and equipment, and there is also a section containing a list of trade and proprietary names. The names and addresses section, containing nearly 4,500 firms associated with plastics, is now divided into two, one for the United Kingdom and the other for overseas. There is also a "Who's Who" in the plastics industry, and a section containing technical and general data. The Year Book is published by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1, price 42s net (postage 1s 9d).

Mersey Dredger Equipment

The General Electric Co., Ltd., has received an order to supply diesel-electric propulsion equipment for the new grab dredger, of 2,200 tons capacity, to be built by Ferguson Brothers (Port Glasgow), Ltd., for the Mersey Docks and Harbour Board.

Cable for Edinburgh Royal Botanic Garden

British Insulated Callender's Cables, Ltd., has supplied some 5,000 yards of mineral insulated cable for the Royal Botanic Garden, Edinburgh. It connects the thermostats and motorised valves in the steam heating system which maintains the required degree of humidity in the glass and

Interior of glass-house at the Royal Botanic Garden, Edinburgh, showing stem-type thermostat leading to valve controlling steam input

propagation houses. Two of the boilerhouses and sections of the lighting circuits are also wired with this type of cable. The installation was carried out by Burgess & Company, Engineers, Ltd., of Bracknell.

Plastics Mobile Showroom

The Plastics Division of Imperial Chemical Industries, Ltd., has equipped a mobile showroom which is touring the group's factories in various parts of the country to enable employees and members of the staff of the other divisions of the group to become better acquainted with the wide industrial uses to which the products of the Plastics Division are applied.

The showroom was recently in London on a site near the headquarters at Millbank, and large numbers of the

Interior of the mobile showroom of the I.C.I. Plastics Division

company's staff availed themselves of the opportunity of inspecting the various plastics materials and some of their applications. The main exhibit from the electrical point of view was a panel on which were mounted electric wires and cables insulated with plastics made by I.C.I. The showroom is continuing its tour to the various factories of the group in the provinces after its London visit.

Radiation Shielding

The exclusive manufacturing rights in Britain of a patent form of radiation shielding, developed in America by Knapp Mills Inc., of New York, have been obtained by David Brown Industries, Ltd. The process, which has particular application in the field of nuclear power, has already been applied on a large scale in the U.S.A. in the shielding of radioactive materials in atomic-powered ships, and in space missiles. It has also been used in conjunction with radiation equipment developed for special application in agriculture, medicine and biology, and where highly corrosive liquids or chemicals need to be contained or where radioactive corrosives must be processed and shielded. Manufacture of the shielding will be carried out at the David Brown Jackson Division, Salford, Lancashire, in the former steel foundry, which was closed down at the end of 1958.

Experimental Atomic Laboratories

The advent of artificial radio-isotopes in Great Britain has made available radioactive substances such as tritium and krypton 85. These materials are suitable for use in light sources in which the light is obtained from phosphors activated by beta particles emitted in the decay process of the radioactive gas. Such sources have half-lives of 10 to 12 years and need no external power supply. They are many times brighter than the more conventional radioactive paints, and sources of a few cubic centimetres in volume can be completely safe in operation and a negligible health hazard in the event of breakage.

Experimental atomic lamps have been manufactured in the B.T.H. Research Laboratory to have an output of 0·0045 lumens, which represents an efficiency of just over 40 lumens per watt. Work in the Application Development Department of the A.E.I. Lamp & Lighting Co., Ltd., has shown that, although they are not sufficiently bright to be used as light sources for illumination, they are suitable for use as indicators, particularly where the provision of other forms of power is difficult and where maintenance is a problem.

Street Lighting Column Competition

The Aluminium Development Association is promoting a competition for the design of aluminium street lighting columns. It is open to lighting specialists, architects, industrial designers, engineers and other individuals or groups. The competition is for the design of either a 25ft high column for trunk road lighting or a 15ft high column for non-trunk road lighting. The Association offers three prizes of £250, £100 and £50, with an additional student's prize of £75. The closing date for entries is 1st July next. Full particulars can be obtained from the Association, 33, Grosvenor Street, London, W.1.

Hoover Developments

The Board of Trade announces that it has concluded negotiations with the sale to the Hoover, Ltd., for company of the factory at Pentrebach, Merthyr Tydfil, which it at present leases from the Board. Hoover, Ltd., on acquisition of these premises, will construct a large extension and in addition will take over on lease from the Ministry of Supply additional accommodation at a former Royal Ordnance factory at Dowlais. This expansion programme will mean that the company's present labour force of approximately 2,000 can be increased by some 500 workers around the end of next year. The expansion in South Wales will necessitate a complementary increase in the output of certain components which are made at Cambuslang in Scotland. Hoover, Ltd., and the Board of Trade are therefore now considering the provision of further production space at the Hoover Scottish factory which is also leased from the Board of Trade.

A.E.I.-Hotpoint Competition

A.E.I.-Hotpoint, Ltd., is promoting a sales contest within the electrical trade in which a Jaguar car is offered as top prize. The cash alternative is £1,500. The period of the contest is from 7th April to 23rd May, and electrical retailers and contractors throughout the country may participate. The contest is for the best and most original "consumer promotion" featuring Hotpoint washing machines. Consolation prizes are also offered.

Trunk Dialling Exchange Contract

Britain's largest subscriber trunk dialling telephone exchange is to be installed at London Trunks, centre of the General Post Office's long-distance network. The contract has been awarded to Standard Telephones & Cables, Ltd., which recently completed an installation enabling operators on the Continental positions at London Trunk Exchange to dial straight through to the major cities in Europe. New type "Registrator-Translator" equipment to be installed will eventually provide subscriber trunk dialling facilities for some 100 automatic exchanges in the London area.

Refrigerator Distributors' New Headquarters

Hampshire Refrigeration, Ltd., Prestcold distributors, whose territory covers Sussex, Surrey, Berkshire and Buckinghamshire, has recently moved its headquarters from Winchester to 37, London Road, Southampton. The company was founded in Winchester

The new headquarters showrooms of Hampshire Refrigeration, Ltd., at Southampton

in 1947 and now has branches at Southsea, Woking, Slough, Maidenhead, Windsor and Brighton.

Instrumentation and Computation Symposium

A joint symposium on instrumentation and computation in process development and plant design, organised by the Institution of Chemical Engineers, the Society of Instrument Technology and the British Computer Society, will be held from 11th to 13th May at the Central Hall, Westminster, London, S.W.1. The symposium is being held under the ægis of the British Conference on Automation and Computation. Full particulars can be obtained from the Institution of Chemical Engineers, 16, Belgrave Square, London, S.W.1.

Inspection Equipment for Czech Steelworks

An order valued at £10,000 for automatic ultrasonic inspection equipment has been placed with Kelvin Hughes (Industrial), Ltd., by Kovo, the Czechoslovakian buying organisation, through Exico, of Sloane Street, S.W.1. The equipment will facilitate the rapid scanning of rolled mild steel bars for internal defects and consists of a remote control console containing the c.r.t. presentation and recording equipment and the remote operating controls for a scanning unit situated above the main feed conveyor.

Price Reduction

Permali, Ltd., Gloucester, has reduced the price of its "Permaflon" p.t.f.e. plastics material by an average of 10 per cent.

Trade Announcements

E.C.C. (Moulded Breakers), Ltd., Fordhouse Road Works, Wolverhampton, announces the appointment of Mr. N. G. O'Hara as sales engineer for London and Southern Counties. Since 1952 he has been with G. P. Dennis, Ltd., as sales engineer for the London area.

G. P. Dennis, Ltd., announce that because of the expansion in demand for their switchgear and the busbar trunking of their associated company, **Trunduct, Ltd.,** they are concentrating their technical sales engineers into smaller areas. Mr. J. W. Menzies has been appointed technical sales engineer for the North-East Coast based on Newcastle whilst Mr. W. H. Tordoff acts in a similar capacity for Yorkshire, based on Leeds.

George Ellison, Ltd., has appointed Mr. A. H. Lothian as sales and technical representative for Ellison hydraulic valves in Scotland and the extreme North of England. He will operate from the office of the Ellison companies, at Ellison House, Woodlands Terrace, Glasgow, C.3.

Linolite, Ltd., has appointed Mr. J. T. Edwards as sales engineer, covering East London and the counties of Essex, Suffolk, Cambridgeshire, Hertfordshire and Huntingdonshire.

Change of Address

The offices of the Society of Relay Engineers have been transferred from Kettering to Obelisk House, Finedon, Northants (telephone: Finedon 204).

Advertisement Correction

In the advertisement of Shinwell Alexander & Co., Ltd., in this issue, the company's address has been omitted. This is 20, Bevis Marks, London, E.C.3 (telephone: Avenue 4761).

IMPORTS OF DOMESTIC ELECTRICAL APPLIANCES

LAST year imports of domestic electrical appliances into the United Kingdom rose by £1·2 million to a total of £4·8 million. The largest individual increase, nearly 130 per cent, was in the value of home laundry equipment. In the 1959 returns this heading will be subdivided so that complete domestic washers, including combined washers and dryers, will be shown separately from complete domestic dryers. This revision was made at the instance of the Export-Import Committee of the Domestic Appliance Division of B.E.A.M.A.

The committee is also trying to get H.M. Customs to give separate figures for space heaters and water heaters. Imports of these and other heating apparatus and elements last year formed the second largest individual item, with a total value of £929,000. The only decrease recorded was for hair clippers and dry shavers. The territorial analysis in the table below has been prepared by the B.E.A.M.A. Export Department from H.M. Customs Bill of Entry Returns. It will be noted that West Germany remains the largest single supplier and that there was a marked increase in imports from Eire, which enjoys duty-free entry into the United Kingdom market.

Territorial Analysis of Domestic Electrical Appliance Imports (£000)

Class	1958	1957
Home laundry appliances and parts	1,267·0	549
Canada	10·9	†
Eire	58·0	†
Sweden	108·6	74
Denmark	31·0	†
West Germany	598·4	175
Netherlands	274·3	121
Belgium	99·3	112
Switzerland	5·7	7
Italy	26·7	†
U.S.A.	34·0	18
Electric cooking apparatus and heating elements therefor	365·0	267
Canada	27·9	46
Eire	42·3	†
Sweden	5·5	10
West Germany	47·1	45
Switzerland	123·8	63
Italy	72·3	58
U.S.A.	31·1	20
Heating apparatus and heating elements therefor (other than for motor vehicles)	929·0	654
Eire	293·5	218
Sweden	5·6	†
Denmark	8·0	†
West Germany	285·3	156
Netherlands	159·5	34
Belgium	54·4	115
Switzerland	10·4	†
Italy	37·3	14
U.S.A.	58·0	43
Parts and accessories for heating and cooking apparatus	305·0	237
Australia	5·1	7
Canada	10·4	†
Eire	22·4	7
West Germany	61·9	46
Netherlands	115·0	85
Italy	40·7	†
U.S.A.	36·9	36
Dishwashers and refuse disposal units, complete	13·0	12
Drink mixers and fruit juice extractors	5·0	†
Food mixers, grinders and slicers	44·0	40
Australia	11·5	25
West Germany	6·2	†
France	21·8	5
Hair clippers and dry shavers	194·0	419
West Germany	19·5	24
Netherlands	20·3	46
Switzerland	61·2	228
Italy	7·1	†
U.S.A.	67·6	88
Vacuum cleaners, complete	659·0	554
Eire	16·1	16
Sweden	28·6	†
Denmark	27·6	†
West Germany	295·3	265
Netherlands	210·4	151
Belgium	26·5	26
France	22·2	†
U.S.A.	28·9	54
Other portable electrical appliances, n.e.s.	185·0	156
Sweden	101·9	60
West Germany	55·8	66
Netherlands	11·8	5
Switzerland	6·2	5
U.S.A.	6·4	†
Parts of portable electrical appliances, n.e.s.	839·0	623
Australia	196·6	95
Sweden	58·7	27
Denmark	13·0	10
West Germany	250·8	216
Netherlands	174·4	140
Belgium	34·2	22
France	15·2	†
Switzerland	42·4	37
U.S.A.	42·9	60

† Under £5,000.

Financial Section

STOCKS and SHARES

ANTICIPATIONS of a stimulating Budget appear to have been overriding some anxiety on other accounts as the main influence upon Stock Exchange markets lately. The mood has been apt to be changeable, but generally confident enough to sustain firm prices and a fair current of activity. In the electrical markets, shares associated with domestic equipment lost a little of their former buoyancy, but the heavier engineering investments continued to benefit from the good impression left by the A.E.I. and English Electric financial results for 1958. The cable manufacturing section of the market has contracted further now that London Electric Wire have followed W. T. Henley's Telegraph into the A.E.I. group, while Telegraph Construction & Maintenance have been similarly merged into B.I.C.C.

E.M.I. Interim

There was a sharp market response to the declaration of a 5 per cent interim dividend by Electric & Musical Industries. Having moved up from 53s 6d to 54s 6d in advance of the announcement, the price subsequently rose to 62s 6d, before reacting to 59s 6d. This event marks a departure from the company's usual practice of making a single annual payment. Dividend policy for the present year was indicated at the time of the one-for-three scrip issue announcement last October. Adequate financial provisions having been made to cover the major expenses of the group's reorganisation plans, the directors felt that some relaxation of the severe conservatism of previous years had become justifiable. They forecast (with the usual reservations) a distribution for the current year of 20 per cent, which would be equivalent to an increase of 8¾ per cent on last year's payment, and would still be covered more than four times over by profits at the 1957–58 level. The prospective yield on the shares is a fraction under 3½ per cent.

Firm Features

Having been affected earlier by some initial disappointment at the absence of any change in the dividend for 1958, Taylor Tunnicliff 5s shares recovered strongly from 18s 3d to 22s 6d on further consideration of the good earnings and the strong financial position. Midland Electric Manufacturing put on another 1s, to 44s 3d, under the influence of the results previously published. Cable and Wireless rose to 13s 3d after the annual meeting, where Sir Edward Wilshaw brought out the points in favour of the well-managed investment trust in comparison with those offered by the unit trusts. There were other useful gains in Allen West at 13s 6d, Chloride Electrical at 72s, Bowthorpe at 12s 6d, A. F. Bulgin at 8s and A. C. Cossor at 7s 6d.

Price Changes

The rather reactionary tendency in domestic equipment issues was noticeable in Hoover at 58s 6d x.d., Morphy-

Price Changes in

Company or Board	Nom. Value	Middle price 16th March	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1958 Highest	1958 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	78½		3	3	3 16 6	77	72
Brit. Elec. 1974/77	100	75½		3	3	3 19 6	73½	68½
Brit. Elec. 1976/79	100	80		3½	3½	4 7 6	78½	72
Brit. Elec. 1974/79	100	88	−½	4¼	4¼	4 16 6	87½	82½
Overseas Electric Supply								
Calcutta Elec.	£1	17/-		6·8†	7†	14 5 0	17/6	15/-
East African Power	£1	21/-	+1/6	7½	8	7 12 6	23/-	17/6
Nigerian Elec.	£1	15/-		10	10	13 6 9	17/-	12/6
Perak Hydro-Elec.	£1	14/6		12½	10	13 16 0	15/6	13/6
Electrical Shares								
Aberdare Holdings	5/-	16/3	+3d	17½	17½	5 7 9	15/9	9/9
Aerialite	1/-	9/-	+3d	51½	54	6 0 0	8/6	5/1
Allen, W. H.	£1	45/-	+1/3	10	11	4 17 9	43/9	32/9
Anglo-Portuguese Tel.	£1	28/3		8	9	6 7 6	29/3	19/9
Aron Elec. Ord.	£1	57/6	−2/6	15	15	5 4 3	61/3	53/-
Assoc. Elec. Ord.	£1	55/-x.d.		15	15	5 9 0	58/9	46/6
Automatic Tel. & El.	£1	78/6	−1/6	17	17	4 6 9	75/-	57/-
Babcock & Wilcox	£1	50/-		15	13‡	5 4 0	54/6	41/9
Bakelite	10/-	26/3		15	15	5 14 3	23/-	17/6
Baldwin, H. J.	2/-	2/9	+3d	20	20	—	3/9	2/6
Berry's Electric	5/-	12/9		10	10	3 18 6	11/3	5/9
Bowthorpe Holdings	2/-	12/6	+3d	37½	25*	4 0 0	11/9	6/6
British Elec. Traction: Def. Ord. "A"	5/-	36/-		25	25	3 9 6	40/-	19/6
B.I. Callender's	£1	47/3	−9d	12½	12½	5 5 9	52/-	38/9
B.I. Callender's 6% Pref.	£1	20/-		6	6	6 0 0	20/3	19/-
British Thermostat	5/-	38/9		25	30	3 17 6	36/3	19/9
British Vac. Cleaner	5/-	7/-		10	7½*	5 7 3	4/6	2/3
Brook Motors	10/-	53/9		25	24½*	4 10 0	45/-	27/9
Bulgin, A. F.	1/-	8/-	+3d	40	45	5 12 6	7/-	4/7
Bulpitts	5/-	12/-		—	12½‡	5 4 3	11/-	7/3
Burco Dean	5/-	12/6		22½	16*	6 8 0	12/6	7/9
Cable & Wireless: Ord.	5/-	13/3	+6d	10	10*	3 15 6	13/-	8/-
4% Loan	100	94½		4	4	4 4 9	94½	89
Chloride El. Storage "A"	£1	72/-	+2/-	17½	17½	4 17 3	68/9	55/6
Clarke Chapman	£1	61/3		27½	13‡*	4 9 9	72/6	55/-
Cole, E. K.	5/-	18/9x.d.		17½	17½	4 13 3	18/-	15/3
Contactor Switchgear	5/-	12/6		20	14*	5 12 0	13/-	9/-
Cossor, A. C.	5/-	7/6	+3d	2½	Nil	Nil	7/9	4/4
Crabtree	10/-	29/-		20	20	6 18 0	32/-	24/4
Crompton Parkinson	5/-	12/9	−3d	16	12*	4 14 0	13/9	8/3
Davis & Timmins	5/-	14/6		22½	18	6 0 0	16/3	10/3
De La Rue	10/-	31/9	+3d	35	17½*	5 10 3	34/-	20/9
Decca "A"	4/-	36/3	−9d	43¾	50	5 10 3	37/6	21/3
Desoutter	5/-	22/6		32½	21¼*‡	4 16 3	19/3	13/6
Dewhurst	2/-	7/6		20	20	5 6 9	9/3	6/9
Dictograph Tel.	2/-	7/6		20	20	5 6 9	7/3	4/7
Dubilier Condenser	1/-	3/9		30	20*	5 6 9	4/3	3/1
Duport	5/-	10/6		25	12½*	5 19 0	10/9	7/9
E.M.I.	10/-	59/6	+6/-	15	20*‡	3 7 3	52/6	20/9
Electrical Apparatus	5/-	13/3		12½	14½	5 9 6	14/-	8/-
Electrical Components	5/-	11/6		12½	12½	5 8 9	10/9	7/-
Elec. Construction	£1	30/-		8½	8½	5 13 3	28/9	21/-
Elliott-Automation	5/-	16/3	−1/3	—	10‡	3 1 6	19/9	11/6
Enfield Cable Ord.	£1	19/-	−6d	Nil	2½	2 12 9	18/9	10/9
English Electric	£1	65/-		14	14	4 6 3	60/-	44/-
English Electric 3½% Pref.	£1	12/6		3½	3½	6 0 0	12/6	11/9
Ericsson Tel.	5/-	25/3	−1/6	12†	13†	4 10 0	26/3	17/6
Ever Ready	5/-	26/3		37½	20*	3 16 3	22/3	13/9
Falk Stadelmann	£1	47/6		17½	15	6 6 3	46/3	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

Richards at 21s 3d x.d., and Vactric at 38s 9d. Decca "A" also gave up some ground, to 36s 3d, while in the field of electronics and computers an easier tendency was seen in Elliott-Automation at 16s 3d and I.C.T. at 66s 3d; both issues stand on an exceptionally low yield basis. A fall of 1s 6d to 78s 6d in Automatic Telephone was apparently in sympathy with the lower profits reported by Ericssons. In the cable group, minor losses in B.I.C.C. and Scottish Cables were balanced by improvements in Pyrotenax and Johnson & Phillips. Enfield Rolling Mills, at 47s, were firm in advance of the dividend declaration.

Electrical Investments

Company or Board	Nom. Value	Middle price 16th March	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1958 Highest	1958 Lowest
Electrical Shares—continued								
G.E.C.	£1	31/3		12½	10	6 8 0	40/-	29/3
G.E.C. 6½% Pref.	£1	21/-		6½	6½	6 3 9	21/6	20/3
General Cables	5/-	8/9		24	15	8 11 6	11/9	8/3
Greenwood & Batley	£1	79/6		17½	20	5 0 9	57/6	45/-
Hackbridge Holdings	5/-	15/-		20	20	6 13 3	15/3	7/6
Hackbridge & Hewittic	5/-	15/-		20	20	6 13 3	14/6	9/7
Head Wrightson	5/-	26/-	+3d	22½	17½*	3 7 3	26/-	16/9
Heatrae	2/-	9/-		15	20	4 9 0	7/9	4/-
Holophane	5/-	15/9		37½	22½*	7 2 9	15/6	12/6
Hoover	5/-	58/6x.d.	−2/-	50	60	5 2 6	58/6	31/-
I.C.I.	£1	34/9		10	12	4 12 0*	37/6	23/9
Intl. Combustion	5/-	33/9		25	30‡	4 9 0	28/3	19/3
Intl. Computers & T.	£1	66/3	−1/3	—	8‡	2 8 3	—	—
Johnson & Phillips	£1	25/-	+1/-	10	5	4 0 0	25/-	15/-
Lancashire Dynamo	£1	47/6		11	11	4 12 6	45/-	28/6
Laurence Scott	5/-	17/3		15	15	4 7 0	16/9	12/6
Lister, R. A.	£1	39/-		10	12½	6 8 3	34/6	23/-
Lucas, J.	£1	46/3	+1/3	7½	10‡	4 6 6	45/-	27/9
Marconi Marine	£1	39/6	−1/9	10	10	5 1 3	40/-	29/-
Marryat & Scott	2/-	9/-		35	37½	4 3 3*	8/9	5/3
Mather & Platt	£1	42/-		15	10½*	5 1 6	50/6	29/6
Metal Industries	£1	43/6	−1/6	9	14	6 8 6	44/-	22/9
Midland Elec. Mfg.	£1	44/3	+1/-	12½	10*	4 10 6	41/3	26/6
Morphy-Richards	4/-	21/3x.d.	−9d	20	20	3 15 3	20/-	14/6
Murex	£1	49/-	+9d	20	17½	7 2 9	59/3	46/9
Newman Ind.	2/-	2/9		10	10	7 5 6	2/9	2/3
Oldham & Son	1/-	2/6		17½	17½	7 0 0	3/-	2/3
Parsons, C. A.	£1	51/3	+1/3	8½	7½*	2 18 6	55/-	43/-
Philips' Lamps	Fl.10	100/-	+1/3	14	14	2 12 9	93/-	47/9
Plessey	10/-	72/6		30	30	4 2 9	72/6	55/-
Pye	5/-	15/6	+6d	12½	12½	4 0 9	17/-	10/-
Pyrotenax	5/-	36/3	+1/3	—	27½‡	3 15 9	37/-	27/6
Reliance Clifton	5/-	17/9	+3d	13½	15	4 4 6	19/9	9/-
Reyrolle	£1	95/-		17½	17½	3 13 9	93/9	73/6
Rheostatic	4/-	8/9		12½	12½	5 14 3	8/6	6/-
Richardsons Westgarth	10/-	15/3	+3d	16½	8½*	5 11 0	15/9	13/-
Scottish Cables	4/-	14/3	−1/-	27½	27½	4 9 9*	12/3	7/-
Simon-Carves	5/-	30/9		20	25	4 1 3	31/3	22/6
Smith (England), S.	4/-	12/6	+3d	20	12½*‡	4 0 0	12/3	7/-
Southern Areas	£1	11/-	−6d	7½	Nil	Nil	13/9	9/3
Strand Elec.	5/-	8/9		15	15	8 11 6	9/3	4/9
Sturtevant	5/-	18/6		15†	15†	7 1 0	19/6	14/9
Sun Elec.	£1	73/-		25	25	6 17 0	60/6	47/3
Switchgear & Cowans	5/-	11/9		25	22½	4 15 9*	9/9	4/6
Taylor Tunnicliff	5/-	22/6	+4/3	17½	17½	3 17 9	18/3	11/9
T.C.C.	10/-	41/-	+1/-	25	25	6 2 0	38/6	32/6
Telephone Mfg.	5/-	5/3		10	10	9 10 6	5/9	4/3
Telephone Rentals	5/-	13/-		12½	12½‡*	4 16 3	14/6	9/9
Thompson (John)	5/-	24/6	+3d	25	25	5 2 0	27/-	23/-
Thorn Elec.	5/-	34/6	−6d	17½	17½	2 10 9	25/-	17/-
Thornycroft	£1	21/3		12½	7½	7 1 3	30/9	21/-
Tube Investments	£1	80/-		15	17½	4 7 6	81/3	48/3
Vactric	5/-	38/9	−1/3	25	25	3 4 6	—	—
Veritys	5/-	2/6		12½	2½	—	6/9	5/3
Walsall Conduits	4/-	18/3		20	22½	4 18 9	18/3	11/-
Ward & Goldstone	5/-	37/-		40	25*	3 7 6	37/-	23/6
Watford	2/-	7/9		25	25	5 3 3*	8/-	4/-
Westinghouse	£1	43/9		10	10	4 11 6	45/-	32/3
West, Allen	5/-	13/6	+3d	15	12½*	4 6 3‡	13/3	7/9
Wolf Electric	5/-	8/3		20	10*	6 1 3	9/-	6/9

Dividends Declared

Ericsson Telephones are bringing the dividend for 1958 to a total of 13 per cent tax free, or 1 per cent more, in effect, than last year's. Earlier the interim payment had been raised by 2 per cent, with the advice that this did not indicate a larger total, and the final is now being reduced by 1 per cent. Trading profits are reported to have contracted by about 20 per cent, to just over £1 million before tax. The shares eased after the announcements to 25s 3d and show a yield of 4½ per cent gross on the new rate of dividend. Aberdare Holdings are maintaining the dividend at a total of 17½ per cent for the fifth time in succession. With the net profit up by 14 per cent, to nearly £300,000 (after a larger tax provision), the rate is now covered more than twice over by available earnings. Philips Electrical were little changed at £5 after news of the maintenance of the dividend at 14 per cent and the proposal of a 5 per cent share bonus.

New Debenture

Dealings began recently in the new £2 million issue of Pirelli-General Cable Works 5½ per cent second debenture. The stock, at present £25 per cent paid up, is available at an all-in price of about 98, and can be bought free of the 2 per cent transfer stamp duty until 6th May, when the final call of £72 per cent falls due to be paid. Redemption dates are between 1979–82. Interest is payable at end-March and September, with an initial distribution of 48s 5d per cent next September: the annual amount is covered more than eight times by profits at the 1957–58 level. Purposes of the issue are to assist in financing a £3½ million programme of capital expenditure on strengthening the competitive position of the company, half of whose ordinary capital is owned by the G.E.C.

Unit Trust

The A.E.G. (Atomic, Electrical & General) Unit Trust is an interesting representative of a type of investment which has acquired much popularity as a means for providing moderate amounts of capital with the advantages of a wide range of interests in industry and commerce. This trust is unusual in some respects, notably the emphasis of the investment policy on growth prospects for earnings and capital, rather than on current income; for the present intention of the management is to make no annual distributions to unit holders but to plough back revenue into the portfolio. At a recent date the latter contained about 60 shares, mainly in companies associated with atomic energy, electronics and automation. The units have been available lately at a price of 11s 10d.

REPORTS and DIVIDENDS

Midland Electric Manufacturing Co., Ltd.—The financial results for the year ended 31st December last were given in our issue of 6th March. In his statement accompanying the report and accounts, Mr. W. J. Barber (chairman) says that trading difficulties overseas accounted for a reduction in turnover during 1958. In particular, owing to import restrictions, they suffered a sharp decline in business with India, which has been a major source of export trade for many years. With export problems, and a lower general level of industrial activity and increasingly keener competition in the home market, a reduction in profits for the year was not unexpected. The profits, before taxation, were £487,152, as compared with £504,817 for 1957, but after taxation they were £246,800 (against £241,843), an improvement to which increased investment income has made a substantial contribution.

The directors have considered the possibility of an interim dividend being paid on the ordinary shares some time during the autumn, and to enable them to do this, if the current year's trading position justifies it, the Articles of Association will have to be amended. An extraordinary meeting will be held after the annual meeting on 2nd April to pass the necessary resolution.

With regard to the current year, there is no indication yet of any substantial increase in current orders. In the home market a steady increase in the outside sales staff is being effected, and they have recently acquired premises in Bristol for use as a branch office and depot, which will provide improved service in that area. In the export field attention is being given to the development of new business to counteract the adverse effect of import restrictions by certain countries.

Taylor, Tunnicliff (Electrical Industries), Ltd.—The preliminary figures for 1958, given in our issue of 6th March, are confirmed by the annual report and accounts now issued.

In his review of the year, Mr. P. Cooper (chairman) says that the company has again increased the production of h.v. insulators and, although Government measures to restrict credit in 1957 and 1958 affected the die pressed product business, which continued at a low level throughout the year, an overall expansion of output was achieved. With the measures to relax credit recently taken by the Government to stimulate domestic demand, the company hopes to see some slight improvement in this class of business. Costs, which continue to rise, and the keener competition prevailing in all classes of production, have resulted in a further decline of profit margins. The reconstruction scheme at the Electric & Ordnance Accessories Co., Ltd., was almost complete by the end of the year. A considerable amount of reconstruction has also been in progress at the Hanley factory and further plans to improve the productive efficiency are being promoted.

Fluctuations in demand for die pressed products are likely to continue, resulting in keener selling prices and restricted profit margins — factors which may have some effect on future earnings. The various businesses, however, have made a fairly promising start in the current year.

Bruce Peebles & Co., Ltd.—The accounts for 1958 show a trading profit of £334,063, as compared with £457,196 for 1957, and after providing for depreciation, etc., and deducting £115,000 for taxation, the net profit is £184,305 (against £205,169). To this is added £72,496 brought in and £10,000 provisions for taxation not now required, making £266,801. General reserve receives £100,000 and the ordinary dividend for the year is maintained at 30 per cent. The balance carried forward is £102,531.

In his circulated statement, Mr. S. A. Gaskell (chairman) says that the report is the fiftieth of the company. They commenced 1958 with a large order book. In common with others they have experienced some contraction in new business taken during the year. This, however, is not without some advantage in competitive conditions when shorter delivery times are expected, and may partly explain a modest improvement in certain directions.

The output was maintained at the same level as in 1957, but the results were less profitable. This is partly explained by the fact that the end of 1957 had seen the completion of a number of large contracts, and serves to emphasise that, with the increasing size of units which they are making and the longer periods of manufacture entailed, it can be misleading to compare too closely one year's results with another. Adverse factors in 1958 were increases in costs and lower price levels.

As main contractors, they have completed a number of installations during the year for the North of Scotland Hydro-Electric Board, the most outstanding being the two 12,000 kW a.c. generators for Shin, Sutherland. The Transformer Department installed the first of three 144,000 kVA generator transformers for the Kincardine power station of the South of Scotland Electricity Board. The nuclear generating station at Chapelcross, Dumfriesshire, came into operation recently, the main transformers for which were manufactured by Bruce Peebles.

The major addition to plant during the year was an impulse generator which gives testing facilities up to 2,500 kV. In addition to giving assistance to their own factories, the electronics research laboratory is carrying out projects for steel and wire manufacturers, the National Coal Board and other customers. Mr. Gaskell refers to his visit last September to Canada, with Mr. W. B. Laing (managing director), and says that while their customers in Eastern Canada expressed their desire to continue to do business with them, the present situation in Canada is such that it is difficult to do so owing to the severe competition among Canadian manufacturers.

Turning to the outlook, the chairman says that future prospects are closely linked with Government policy, and the recent measures taken towards expansion of capital investment should in time have the desired effect.

Particulars are circulated with the report and accounts of proposals to increase the authorised capital to £1,500,000 by capitalising £711,120 of general reserve and issuing 711,120 ordinary shares of £1 each, credited as fully paid, to the ordinary stockholders in the proportion of two shares for every £1 of ordinary stock held, and alter the Articles of Association to provide for the ordinary stock being transferable in units of 10s each. These proposals will be submitted at an extraordinary meeting to be held following the annual general meeting on 3rd April.

Franco Signs, Ltd.—The group trading profits for the year to 30th September last amount to £129,845, as compared with £115,484 for 1956–57, and after deducting £69,189 for taxation, the profits attributable to the company are £63,191 (against £53,300). The dividend for the year on capital increased by a two-for-five rights issue is 10 per cent, and in addition a special non-recurring interim dividend for 1958-59 of 3½ per cent is proposed, making 13½ per cent, the same as for the previous year on the old capital. It is stated that the interim dividend will not be taken into account when considering further dividends for the current year.

Ericsson Telephones, Ltd.—The group trading profits for 1958 are £1,002,396, as compared with £1,251,112 for 1957, and after providing £536,376 for taxation, the net profit is £446,020 (against £584,359). General reserve receives £300,000 and it is proposed to pay a final dividend of 9 per cent, making 13 per cent tax free for the year. For the previous year the total distribution was 14 per cent, but the interim dividend was paid on half the present capital. The balance carried forward is £277,875 (against £379,919 brought in).

Electric & Musical Industries, Ltd., has declared an interim dividend of 5 per cent on capital increased by a one-for-three scrip issue. For 1957-58, there was a single payment of 15 per cent, equivalent to 11¼ per cent on the present capital.

Aberdare (Holdings), Ltd., formerly Aberdare Cables (Holdings), Ltd., reports that after providing £364,851

for taxation, the net group profit for 1958 is £298,639, as compared with £262,583 for 1957. The dividend for the year is maintained at 17½ per cent by a final payment of 10 per cent. The balance carried forward is £863,449 (against £695,587 brought in).

Bakelite, Ltd., report group profits for 1958 of £538,458, as compared with £431,022 for 1957. Taxation absorbs £250,609, and the net balance, after providing for depreciation, debenture stock interest and taxation, is £239,330 (against £225,472). The ordinary dividend for the year is maintained at 15 per cent by a final payment of 10 per cent.

The Bagdad Light & Power Co., Ltd., has received an offer from Rea Brothers, bankers, on behalf of clients, of 86s 4d for each of the 300,000 1s ordinary stock units. The directors consider that the offer is fair and reasonable.

Stothert & Pitt, Ltd., have declared an interim dividend of 5 per cent (unchanged) on increased capital.

Thos. W. Ward, Ltd., have declared an interim dividend of 5 per cent (unchanged).

Increases of Capital

Yarrow & Co., Ltd. — Increased by £150,000 in £1 ordinary shares, beyond the registered capital of £600,000.

Holliday, Hall & Stinson, Ltd.—Increased by £5,000 in £1 ordinary shares, beyond the registered capital of £50,000.

Cambridge Instrument Co., Ltd. — Increased by £500,000 in £1 shares, beyond the registered capital of £1,000,000.

D. P. Battery Co., Ltd. — Increased by £100,000 in £1 ordinary shares, beyond the registered capital of £100,000.

B. French, Ltd.—Increased by £50,000, in £1 ordinary shares, beyond the registered capital of £50,000.

New Companies

Veritys (1959), Ltd.—Registered 9th March. Capital £100. Electricians, electrical and general engineers, mechanical engineers, artificers in metal; wood and slate workers; makers of and dealers in enamel, etc. Solicitors: Lee Crowder & Co., 24, Harborne Road, Birmingham, 15.

East Anglian Electrics, Ltd.—Registered 26th February. Capital £1,000. Wiring and general electrical installation contractors, etc. Directors: C. A. Peacock, C. King, F. H. Holmes and H. G. Holmes. Regd. office: Elm Avenue, Gorleston-on-Sea, Norfolk.

Tern Electrics, Ltd.—Registered 26th February. Capital £5,000. Electricians, electrical contractors and engineers, television and radio engineers, etc. Directors: T. H. Carr, N. Lambley, Mrs. Margaret Carr and W. E. Bull. Regd. office: 82, Canal Street, Nottingham.

Magnite, Ltd.—Registered 26th February. Capital £1,000. Designers and manufacturers of and dealers in electric and electronic machines, equipment and instruments of all kinds, etc. Regd. office: 12, Somerset House, George Street, Halifax.

Manchester Cables & Accessories, Ltd.—Registered 26th February. Capital £100. Manufacturers of and dealers in electrical and other cables, cores, conductors, etc. Directors: R. C. Clough and R. A. Clough. Regd. office: 609, Stretford Road, Old Trafford, Manchester, 16.

Switchgear & Instrumentation, Ltd.—Registered 12th February. Capital £1,000. Electrical, mechanical, radio, television, telephone, lighting, heating, motor and general engineers, etc. Regd. office: 61, Albion Street, Leeds.

Duke & Co. (London), Ltd.—Registered 12th February. Capital £1,000. Radio and television engineers, sound, acoustic and electrical engineers and general electrical installation contractors, lighting specialists, etc. Directors: H. F. D. Philbey and Mrs. Patricia N. Philbey. Regd. office: 153/5, Hamlet Court Road, Westcliff-on-Sea.

Howard's (Portsmouth), Ltd.—Registered 2nd February. Capital £5,000. Electrical engineers and contractors, etc. Directors: J. T. Howard and J. F. A. St. Aubyn. Regd. office: 94, Tavistock Road, Plymouth.

Electrical Sales & Services, Ltd.—Registered 3rd March. Capital £500. Electricians, electrical and wiring contractors, etc. Directors: V. C. Allen and R. A. Gardner. Regd. office: Acre End Street, Eynsham, Oxon.

G. A. Pickett (Abingdon), Ltd.—Registered 3rd March. Capital £10,000. Electrical, radio and television engineers, etc. Directors: G. A. Pickett and Mrs. Winifred A. Pickett. Regd. office: 51, Stert Street, Abingdon, Berks.

Bankruptcy

A. E. Young and **G. A. B. Thompson,** trading as Thompson & Young, Station Road, Darley Dale, New Matlock, and also formerly trading at The Cross, Bonsall, Derbyshire, electrical contractors and radio and television engineers.—Receiving order made 2nd March on debtors' own petition. Public examination 5th May at the Court House, 20, St. Peter's Churchyard, Derby.

Electrical Imports of Malaya and Singapore

THE value of electrical goods imported by Malaya and Singapore rose during 1957 to £11·5 million compared with £10·9 million in 1956. British firms have a dominant position in the market and, despite increased competition from West Germany, Holland, Japan and the United States, they accounted for 71 per cent of the total electrical imports in 1957. As will be seen from Table 2, the most important single items were insulated cables (£2,418,000), radio and, television receivers (£825,000), electric locomotives (£813,000) and generators (£633,000).

Table 1.—Principal Suppliers, 1957

Country	Value (£000)
United Kingdom	8,233
South Africa	20
Canada	13
Hong Kong	174
India	72
Australia	188
Austria	21
West Germany	954
Italy	30
Holland	808
Sweden	139
United States	434
China	40
Japan	567

Table 2.—Electrical Imports

Product	Value (£000)
Convertors and rectifiers	21
United Kingdom	15
Transformers, etc.	292
United Kingdom	276
United States	6
Generators under 10 kW	37
United Kingdom	31
Ditto, above 10 kW	596
United Kingdom	518
Japan	61
Motors, under 1 h.p.	45
United Kingdom	28
West Germany	7
Ditto, 1 to 25 h.p.	96
United Kingdom	58
Sweden	22
Ditto, 25 h.p. to 100 h.p.	40
United Kingdom	23
Sweden	9
Ditto, above 100 h.p.	71
United Kingdom	63
Switchgear and control panels	352
United Kingdom	332
Japan	15
Parts of motors, transformers, generators, switchgear	325
United Kingdom	292
Sweden	21
Batteries, torch	184
United Kingdom	51
Hong Kong	10
United States	18
Ditto, n.e.s.	369
United Kingdom	246
India	45
Ditto, parts	169
United Kingdom	27
Australia	61
United States	79
Filament lamps	242
United Kingdom	133
West Germany	15
Holland	75
Japan	13
Domestic radio and TV receivers, incl. radiograms	825
United Kingdom	83
West Germany	431
Holland	303
Radio receivers n.e.s.	306
United Kingdom	20
Radio receivers, n.e.s.—*continued*	
West Germany	91
Holland	166
Japan	23
Radio transmitters	163
United Kingdom	121
Australia	22
United States	17
Parts and accessories for radio equipment	352
United Kingdom	165
West Germany	58
Holland	69
Telegraph and telephone apparatus	116
United Kingdom	102
Cooking appliances	132
United Kingdom	71
West Germany	6
Heating apparatus and parts	225
United Kingdom	175
West Germany	21
Flat irons	74
United Kingdom	57
Holland	14
Welding apparatus	56
United Kingdom	25
Austria	9
Welding electrodes	219
United Kingdom	127
Australia	20
Austria	19
United States	37
Supply meters	127
United Kingdom	127
Radiological and medical apparatus	50
United Kingdom	17
Holland	18
Domestic washing machines	39
United Kingdom	31
Vacuum cleaners and floor polishers	37
United Kingdom	32
Insulated cables and wires (except telegraph and telephone)	1,618
United Kingdom	1,490
West Germany	49
Ditto, telegraph and telephone	800
United Kingdom	800
Accumulators	374
United Kingdom	258
Australia	40
West Germany	51
Insulators	40
United Kingdom	68
Ceiling fans	255
United Kingdom	212
India	25
Table fans	171
United Kingdom	45
Holland	13
Japan	103
Electric locomotives	813
United Kingdom	740
Canada	73

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1955

5972. Charlesworth, P. A.—Electrolytic treatment of metals and alloys for the removal of metal from the surface thereof. 29th November, 1956. (810475.)

10553. Yardney International Corporation.—Primary and secondary electric cells and batteries. 12th April, 1955. (810549.)

11548. Rank Cintel, Ltd.—Apparatus for deriving video signals. 23rd April, 1956. (810550.)

12627. Electrolux, Ltd.—Vacuum cleaners. 2nd May, 1955. (810441.)

17137. General Electric Co.—Turbomachine rotor with air-cooled blading. 14th June, 1955. (810459.)

18632. Igranic Electric Co., Ltd.—Control apparatus for power operated presses and the like. 28th June, 1955. (810460.)

20200. Paton & Co., Ltd., and Eva, A. W.—Electric coaxial plug-and-socket connectors. 31st July, 1956. (810556.)

20531. Standard Telephones & Cables, Ltd.—Method of manufacturing semiconductor devices. 15th July, 1955. (810382.)

24999. General Electric Co.—Semiconducting elements of silicon. 31st August, 1955. (810558.)

30886. Licentia Patent-Verwaltungs-G.m.b.H.—Auto-self-excited transductor. 28th October, 1955. (810384.)

35038. General Electric Co., Ltd.—Metal vapour electric arc convertors. 26th November, 1956. (810387.)

36311. International Business Machines Corporation.—Electronic multipliers. 19th December, 1955. (810656.)

1956

1567/8. Western Electric Co., Inc.—Methods and apparatus for the extrusion of plastic compounds. 17th January, 1956. (810586/7.)

3105. Thompson Products, Inc.—Thermostatically controlled cooling fan drive. 31st January, 1956. (810659.)

3818. British Thomson-Houston Co., Ltd.—Vacuum jackets for metal vapour electric discharge lamps. 7th February, 1957. (810661.)

5011. Western Electric Co., Inc.—Ferroelectric signal storage devices. 17th February, 1956. (810451.)

5013. Western Electric Co., Inc.—Signal translating apparatus and circuits employing semiconductor bodies. 17th February, 1956. (810452.)

5392. British Thermostat Co., Ltd.—Heat operated motor. 29th January, 1957. (810662.)

7448. Standard Telephones & Cables, Ltd. (Standard Electrica S.A.).—Telephone subscriber's sets. 9th March, 1956. (810588.)

7459. Olympia Werke A.G.—Typewriting office machine having switch controlled electric driving means. 9th March, 1956. (810496.)

8375. Welwyn Electrical Laboratories, Ltd., and France, G.—Apparatus for the measurement of resistors. 16th March, 1956. (810665.)

10474. Bleckmann, A., Damhofer, E., and Bleckmann, H.—Tubular electric heaters. 5th April, 1956. (810667.)

15716. Pfaff A.G., G. M.—Electrical control systems for group stitch sewing machines. 22nd May, 1956. (810470.)

18314. Sylvania Electric Products, Inc.—Article transfer apparatus for example for use in electric lamp manufacture. 13th June, 1956. (810504.)

21086. Siemens & Halske A.G.—High frequency cables. 6th July, 1956. (810679.)

21620. General Electric Co., Ltd.—Electrical switching circuits. 9th July, 1957. (810506.)

22084. Western Electric Co., Inc.—Electromagnetic agitation of liquids. 17th July, 1956. (810449.)

22684. Standard Telephones & Cables, Ltd.—Co-ordinate multi switches and mounting arrangements therefor. 19th July, 1957. (810392.)

23816. Belling & Lee, Ltd.—Electrical connectors. 26th July, 1957. (810616.)

24545. Standard Telephones & Cables, Ltd.—Loudspeaking station for automatic telephone systems. 10th August, 1956. (810393.)

25316. Thorn Electrical Industries, Ltd.—Closed-circuit television systems. 7th August, 1957. (810619.)

28107. Belling & Lee, Ltd.—Housing for electrical connections. 26th July, 1957. (810623.)

29697. Philips Electrical Industries, Ltd.—Kinematograph film projectors. 28th September, 1956. (810522.)

30388. Kokusai Denki Kabushiki Kaisha.—Electromechanical wave filters. 5th October, 1956. (810523.)

35181. Sanders (Electronics), Ltd., W. H.—Magnetic recording and reproducing unit. 8th August, 1957. (810690.)

1957

1148. Standard Telephones & Cables, Ltd.—Radio diversity receiving system. 11th January, 1957. (810698.)

2451. Machlett Laboratories, Inc.—Electron tubes. 23rd January, 1957. (810399.)

5609. General Electric Co.—Silicone elastomers. 19th February, 1957. (810532.)

10311. Halftermeyer, R.—Manufacture of variable condensers. 29th March, 1957. (810407.)

12075. Metals & Controls Corporation.—Electrical heater assemblies. 12th April, 1957. (810710.)

15733. Hubbell, Inc., H.—Electrical connectors. 17th May, 1957. (810712.)

16085. Compagnie Générale de Télégraphie sans Fil.—Pulsed radar systems. 21st May, 1957. (810410.)

24000. Collins Radio Co.—Remote control systems for electric motors. 29th July, 1957. (810649.)

24103. Electrolux, Ltd.—Vacuum cleaner motor-fan units. 2nd May, 1955. (Divided out of 810441.) (810442.) 24104-8. Vacuum cleaners. 2nd May, 1955. (Divided out of 810441.) (810443-7.)

24734. Ammon, R. A.—Electrical current measuring instruments. 25th June, 1956. (Divided out of 810594.) (810595.)

24871. Standard Telephones & Cables, Ltd. (Standard Electrica S.A.).—Light current contact-making pile-ups. 9th March, 1956. (Divided out of 810588.) (810589.)

29960. Siemens-Schuckertwerke A.G.—Nuclear reactors. 24th September, 1957. (810718.)

32767. Standard Telephones & Cables, Ltd.—Electrical or telephone jack key or lamp units and assemblies thereof. 21st October, 1957. (Addition to 810074.) (810430.)

33712. Standard Telephones & Cables, Ltd.—Amplifiers employing transistors. 29th October, 1957. (810417.)

34526. Telefunken G.m.b.H.—Short wave directional aerial arrangements. 5th November, 1957. (810418.)

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to the dates stated:—

4th April

Electro-Mist. No. 776,314. Class 7. Electronic machines for purifying air by means of electrostatic precipitation.—American Air Filter Co., Inc., Louisville, Kentucky, U.S.A. Address for service, c/o Stevens, Langner, Parry & Rollinson, 5 to 9, Quality Court, Chancery Lane, London, W.C.2.

Galamatic. No. 782,288. Class 7. Electric machines for domestic use, but not including sewing machines or any goods of the same description.—A.E.I.-Hotpoint, Ltd., 33, Grosvenor Place, London, S.W.1.

Nashton. No. 773,141. Class 9. Electrical measuring apparatus and instruments; and electric batteries.—Nash & Thompson, Ltd., Oakcroft Road, Chessington, Surrey.

Ray-O-Vac (design). No. 782,437. Class 9. Electric dry cells, dry cell batteries and cases for electric pocket lamps and for electric torches. **Ray-O-Vac** (design). No. 782,438. Class 11. Electric torches.—Electric Storage Battery Co., Philadelphia, Penn., U.S.A. Address for service, c/o Gill, Jennings & Every, 51-52, Chancery Lane, London, W.C.2.

Oakford. No. B781,563. Class 15. Electrical and mechanical pipe organs.—R. T. Wright, trading as S. J. Wright & Son, Oakford Works, 2a, Oakford Road, Kentish Town, London, N.W.5.

11th April

Paramount. No. 783,210. Class 9. Electric vacuum cleaning apparatus.—Victoria Electrical Co. (Manchester), Ltd., 25, Blackfriars Street, Manchester.

Compudesk. No. 783,794. Class 9. Scientific and electrical apparatus and instruments.—Elliott Brothers (London), Ltd., Century Works, Lewisham, S.E.13.

Street Lighting Plans

Burnham-on-Sea U.D.C. is spending £10,000 on schemes to improve street lighting in Burnham and Highbridge.

Coventry City Council is recommended to apply for consent to borrow £10,000 for Stage D of its street lighting conversion scheme, which envisages the replacement of 291 gas lamps by electric lamps and the installation of an additional 85 electric lamps.

Proposed street lighting in **Glastonbury** is estimated to cost £11,000.

The third stage of **Newcastle-on-Tyne** City Council's scheme for converting street lighting from gas to electricity is expected to be completed in June. The fourth stage will cost more than £67,000.

Stoke-on-Trent City Council is applying for permission to borrow £37,776 for street lighting improvements.

Walsall Corporation proposes to carry out schemes for the re-lighting of various residential roads in the borough at an estimated cost of £16,000.

Worcester City Council is recommended to seek sanction to borrow £16,360 for street lighting improvement.

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

MONDAY, 23rd MARCH

Birmingham.—James Watt Memorial Institute, 6 p.m. I.E.E. South Midland Electronics and Communications/Measurement and Control Group. "The History of B.B.C. Television," by R. T. B. Wynn.

Leeds.—Fuel Department Lecture Theatre, Leeds University, 7.30 p.m. Institution of Plant Engineers, West and East Yorkshire Branch. Annual general meeting.

Leicester.—East Midlands Electricity Board, Charles Street, 7 p.m. I.E.S. Leicester Centre. "An Architect Looks at Lighting," by S. Penn-Smith.

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Electronics and Communications Section. "High Quality Microphones," by M. L. Gayford (in the Lecture Theatre), and "Effects of Argon Content on the Characteristics of Neon-Argon Glow-Discharge Reference Tubes," by Dr. F. A. Benson and P. M. Chalmers (in the Tea Room).

Middlesbrough.—Cleveland Scientific and Technical Institution, Corporation Road, 6 p.m. North East Coast Institution of Engineers and Shipbuilders, Tees-Side Branch. "Some Engineering Developments in the Nuclear Power Field," by Dr. A. T. Bowden.

Newcastle-on-Tyne.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North Eastern Centre. "The Selection of Insulation Levels and Tests for High Voltage Transformers," by G. B. Harper.

TUESDAY, 24th MARCH

Bradford.—At the Institute of Technology. I.E.S. Leeds Centre and I.E.E. North Midland Centre. "Fifty Years of Lighting Development (1909-1959)," by J. W. Howell.

Bristol.—Grand Hotel, Broad Street, 7.15 p.m. Institution of Plant Engineers, Western Branch. Annual general meeting.

School of Management Studies, Unity Street, 7 p.m. British Institution of Radio Engineers, South Western Section. "Recent Advances in Travelling Wave Tubes," by P. F. C. Burke.

Edinburgh.—Usher Hall, 7.30 p.m. I.E.E. Scottish Centre. Faraday Lecture, "Automation," by Dr. H. A. Thomas.

London.—At the I.E.E., Savoy Place, W.C.2, 6.30 p.m. A.S.E.E. London National Lecture. "New Materials, Methods and Techniques in Electrical Engineering," by Dr. H. G. Taylor.

Manson House, Portland Place, W.1, 6 p.m. Society of Instrument Technology, London Meeting. "New Directions in Engineering Psychology," by Dr. R. Conrad.

St. Ermins Hotel, Westminster. Combustion Engineering Association, Southern Region. 10.30 a.m. "The Costing of Heat and Power," by G. H. Buckle. 2.30 p.m. "Capital Investment and Fuel Saving Schemes," by R. H. Potterill.

Connaught Rooms, W.C.2, 12.30 for 1 p.m. Radio Industries Club. Luncheon. Speaker: Major L. H. Peter.

Manchester.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North Western Measurement and Control Group. "Some Recent Researches into the Problems Associated with the Bottom Bearings of Electricity Meters," by G. F. Shotter.

Newcastle-on-Tyne.—Crown Hotel, 7.30 p.m. A.S.E.E. Tyneside Branch. Films.

Spalding.—E.M.E.B. Service Centre, 7.30 p.m. I.E.E. East Midland Centre. "The Design of the 330 kV Transmission System for Rhodesia," by F. C. Winfield, T. W. Wilcox and G. Lyon.

WEDNESDAY, 25th MARCH

Cardiff.—Welsh College of Advanced Technology, 6.45 p.m. Society of Instrument Technology, South Wales Section. Annual general meeting, followed by "The Instrumentation of a Nuclear Power Station," by K. R. Sandiford.

Chester.—Grosvenor Museum, Grosvenor Street, 7 p.m. Society of Instrument Technology, Chester Branch. "Industrial Applications of Transistors," by D. G. Holloway.

Christchurch.—King's Arms Hotel, 6.30 p.m. I.E.E. Southern Centre. "The Application of Transistors to Line Communication Equipment," by H. T. Prior, D. J. R. Chapman and A. A. Whitehead.

Farnborough.—I.E.E. Southern Centre. "Three Weeks in the U.S.S.R.", by Sir Josiah Eccles.

Glasgow.—39, Elmbank Crescent, 7 p.m. I.E.E. South West Scotland Sub-Centre. "Thermonuclear Fusion and the Development of Zeta," by E. R. Hartill.

Ipswich.—Ipswich and District Electrical Association. Visit to Eastern Gas Board, Gas Works.

Kingston.—Coombe Hill Golf Club. A.S.E.E. Golfing Society. G.E.C. Trophy.

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Supply Section. "The Selection of Insulation Levels and Tests for High Voltage Transformers," by G. B. Harper.

A.S.E.E. North West London Branch. Visit to *Daily Express*.

Connaught Rooms, W.C.2, 12.30 for 12.55 p.m. Batti-Wallahs' Society. Luncheon. Guest speaker, Sir John Lang.

London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1, 3 p.m. and 6.30 p.m. British Institution of Radio Engineers. Symposium on "Radio Telemetry."

THURSDAY, 26th MARCH

Blackburn.—White Bull Hotel, 7.30 p.m. Institution of Plant Engineers, Blackburn Branch. Annual general meeting.

Croydon.—Greyhound Hotel, High Street, 8 p.m. A.S.E.E. South London Branch. "Safety in the Uses of Electricity," by S. J. Emerson.

Hove.—New Imperial Hotel, 1st Avenue, 7.30 p.m. A.S.E.E. Brighton, Hove and District Branch. "Floor Warming," by D. J. Hunt.

Sheffield.—Grand Hotel, 7.30 p.m. Institution of Plant Engineers, Sheffield Branch. "Refractories," by T. R. Lynam.

CATALOGUES AND LISTS

CABLE GLANDS.—Leaflet and price list dealing with weatherproof nylon cable glands and plastic insulating bushes.—**Elkay Electrical Manufacturing Co., Ltd.**, 42, Woburn Place, London, W.C.1.

CIRCUIT-BREAKERS. — 28-page catalogue (SG/251) covering air-blast circuit-breakers for a voltage range of 110 kV to 165 kV with a maximum breaking capacity of 5,000 MVA.—**English Electric Co., Ltd.**, Queens House, Kingsway, London, W.C.2.

CONDUIT.—66-page illustrated and priced catalogue giving particulars of the company's range of conduits and conduit fittings. Illustrations of various manufacturing processes are also included.—**Barton Conduits, Ltd.**, Beehive Works, Old Birchills, Walsall, Staffs.

DRILLING MACHINE. — Illustrated brochure describing the "Ime" precision drilling machine designed for the watch, instrument and electrical industries.—**Ideal Machine Tool & Engineering Co., Ltd.**, 282, Kingsland Road, London, E.8.

INSTRUMENTS.—Leaflet (28) describing a new "Centre-Line" indicator-controller and a brochure (144/A) dealing with some of the technical problems associated with gas analysis by the thermal conductivity method and including data on the company's "Katharometer."—**Cambridge Instrument Co., Ltd.**, 13, Grosvenor Place, London, S.W.1.

INSULATING MATERIALS.—Booklet describing the features and physical properties of "Sintox" ceramic electrical insulating material.—**Lodge Plugs, Ltd.**, Rugby.

LIGHTING FITTINGS. — Illustrated leaflet giving particulars of a lightweight fibreglass reflector designed for use with festoon lighting equipment and suitable for use on building sites, in chemical works, outdoor events and underground locations, etc.—**D.R. Illuminations, Ltd.**, Warren Street, Stockport, Cheshire.

24-page illustrated and priced catalogue covering the "Summit" range of fluorescent lighting fittings.—**Falk, Stadelmann & Co., Ltd.**, 91, Farringdon Road, London, E.C.1.

Broadsheet containing prices, particulars and illustrations of watertight outside lanterns.—**G.B.M. (Electrical), Birmingham**, 439, Moseley Road, Birmingham, 12.

56-page catalogue and separate price list giving particulars and illustrations of the company's range of fluorescent lighting fittings.—**H. W. Field & Son, Ltd.**, Harold Wood, Essex.

MOTOR CONTROL GEAR.—Looseleaf binder containing catalogue sheets dealing with a.c. and d.c. contactor type control gear and accessories.—**Contactor Switchgear, Ltd.**, Wolverhampton.

REFRIGERATORS.—Three leaflets describing the range of "Atlas" refrigerators manufactured in Denmark and available from the British distributors.—**Scandinavian Sales**, 171, Kirkdale, London, S.E.26.

STEAM TURBINES.—40-page catalogue (ST/177) describing non-reheat steam turbines of 10 MW ratings and above and a catalogue (ST/121) dealing with geared steam turbo-generating sets of the condenser type with outputs of 750 kW to 5,000 kW.—**English Electric Co., Ltd.**, Queens House, Kingsway, London, W.C.2.

TECHNICAL DICTIONARIES. — 40-page catalogue giving particulars of technical dictionaries covering more than 180 subjects in various languages.—**Bailey Bros. & Swinfen, Ltd.**, Hyde House, West Central Street, London, W.C.1.

TERMINAL BLOCKS.—Priced catalogue (NBQ/12) illustrating and describing the range of terminal blocks available from the company.—**Metway Electrical Industries, Ltd.**, Canning Street, Brighton, 7.

VACUUM PUMPS.—Pamphlet (A.177/1) giving details of three high-vacuum motor driven single stage rotary pumps.—**Edwards High Vacuum, Ltd.**, Manor Royal, Crawley, Sussex.

VALVE ACTUATORS.—Catalogue giving details of electric actuators for valve control. The actuators incorporate an electric motor, driving the valve through reduction gearing, and a control box housing the switches necessary to limit and control the travel of the valve, indicate its position and protect both valve and motor.—**Rotork Engineering Co., Ltd.**, Widcombe Manor, Bath.

WELDING.—Pamphlet dealing with the advantages of the company's 3-phase system of electric welding.—**Sciaky Electric Welding Machines, Ltd.**, Falmouth Road, Slough, Bucks.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—Australian Aluminium Production, Bell Bay, Tasmania. 21st April. Rectifier plant. (E.S.B. 4933/59. Ten/37625.)*

Beddington and Wallington. — Borough Council. 6th April. 142 group "B" concrete street lighting standards complete with totally enclosed 60 W sodium vapour lanterns, lamps and control gear. Borough Engineer's Department, Town Hall, Wallington.

Bury.—Corporation. 11th April. Street lighting equipment. (See this issue.)

Canada.—Winnipeg Hydro-Electric System. 25th March. Distribution transformers. (E.S.B. 6710/59. Ten/37965.)*

Cheltenham.—Corporation. 16th April. Street lighting equipment. (See this issue.)

Coleraine.—Londonderry County Education Committee. 17th April. Electrical installation in Coleraine Technical School (extension). County education architect, The Manor House, Coleraine.

Formosa.—Central Trust of China, Taipei. 7th April. 69 kV transformer and lighting fittings. (E.S.B. 6151/59. Ten/37849.)*

Grimsby.—Borough Council. 13th April. Electrical installation in new offices for the Weights and Measures Department, King Edward Street. J. V. Oldfield, borough engineer and architect, Municipal Offices, Town Hall Square.

Heywood.—Corporation. 3rd April. Street lighting equipment. (See this issue.)

India.—Bombay Electricity Supply and Transport Undertaking. 30th April. Protective relays and equipment for modernising the protective system of the 6·6 kV distribution network of Kingsway receiving station. (E.S.B. 5906/59. Ten/37798.)*

Hindustan Steel (Private), Ltd., New Delhi. 30th March. Transformer and distribution pillar box. (E.S.B. 6056/59. Ten/37805.)*

Madras State Electricity Board. 28th March. House service meters. (E.S.B. 6471/59. Ten/37903.)*

Damodar Valley Corporation, Calcutta. 30th March. Pedestal and line insulators, 1st April. A.c.s.r. conductors, earth wire, erection tools and accessories. (E.S.B. 6054/59. Ten/37804.)*

Government Electricity Department, Andra Pradesh. 30th April. 66, 33 and 11 kV substation equipment. (E.S.B. 4083/59. Ten/37714.)*

India Supply Commission. 30th April. 66, 33 and 11 kV substation equipment for Andra Pradesh Government Electricity Department. (See this issue.)

Iraq.—Directorate General of Municipalities, Baghdad. 4th April. Transformers and switchgear for Amarah Water and Electricity Board. (E.S.B. 6341/59. Ten/37878.)*

Launceston.—Corporation. 11th April. Trunk road lighting equipment. (See this issue.)

London.—Stepney Borough Council. 13th April. Electrical installations in blocks of dwellings, Sidney Street; two passenger lifts; and lightning conductor installation. (See this issue.)

Luton.—R.D.C. 18th April. Equipment for class "A" sodium street lighting scheme. Surveyor, 48, Bute Street, Luton.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

Lytham St. Annes.—Borough Council. 7th April. Lighting equipment for group "A" street lighting installation. Borough engineer, Town Hall.

Malta.—Maltese Government. 5th May. Five electro-submersible pumping sets with motors, starters, cabling, etc. (See this issue.)

Manchester.—Corporation. 3rd April. Three 240 kW electric immersion heater water circulating units for Wythenshawe Baths. (See this issue.)

New Zealand.—G.P.O., Wellington. 13th April. Terminal blocks. (E.S.B. 5691/59. Ten/37747.)*

Saddleworth.—U.D.C. 4th April. Sodium discharge street lighting installation. (See this issue.)

Thailand.—Royal Irrigation Department, Bangkok. 28th April. Two 73,684 kVA hydraulic turbine-driven a.c. generators. (E.S.B. 4448/59. Ten/37553.)*

United States.—Bureau of Reclamation, Denver, Colorado. 7th April. Three auto-transformers for Huron substation. (E.S.B. 5320/59. Ten/37800.)*

ORDERS PLACED

Carlisle.—City Council. Group "A" lighting on various bus routes in the city area (£12,573).—B. L. Oliver.

Durham.—County Education Committee. Electrical work in schools:—Ferryhill, Jarrow Central Modern School (£456), Hebburn Technical College (£13,451) and Shotton Modern School (£408).—North of England Engineering & Electrical Co. Crook Junior Mixed School (£1,334) and Crook County Infant School (£976).—R. Robson. Birtley Leafield House Hostel for Maladjusted Children (£1,326).—Robson & Coleman, Ltd. Newton Aycliffe Stephenson Way Junior School (£2,034).—G. S. Akinhead & Co., Ltd.

London.—L.C.C. Ten electric passenger lifts on Clive Street site, Stepney, and Rotherhithe New Road site, Bermondsey (£44,430).—Express Lift Co., Ltd. Supply and installation of electric water heaters in 209 dwellings at the Becontree estate, Dagenham (£10,528).—F. J. Baynes & Co., Ltd.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Barnsley. — Town Hall extensions; Lanchester & Lodge, architects, 10, Woburn Square, W.C.1.

Bath.—Five-storey block of maisonnettes, Snow Hill; Snailum & Le Fevre, architects to Council, 18, Brock Street, Bath.

Beckenham.—Flats (64), Bromley Road; Oliver R. Croudace, Ltd., 97, Godstone Road, Caterham.

Bingham.—Houses at Bingham (50), Radcliffe-on-Trent (50) and Keyworth (51); William Saunders & Partners, architects to Council, 24, Castle Gate, Newark-on-Trent.

Bourne (Lincs.).—Phase 2 of modernisation of St. Peter's Hospital; S. W. Appleyard & Partners, architects to Hospital Board, Ironmongery Street, Stamford.

First instalment of new two-form entry grammar school (£50,000); Kesteven county architect, Sleaford, Lincs.

Camberley.—Dwellings (366), for town expansion scheme; U.D.C. surveyor.

Cambridge.—Houses (128), Newmarket Road estate and High Street, Chesterton; city surveyor, The Guildhall.

Hemel Hempstead.—Junior mixed and infants' schools at Gadebridge (£107,428); C. H. Aslin, Herts. county architect, County Hall, Hertford.

High Wycombe.—Houses (142), Hicks Farm estate; G. A. Griffiths & Son, builders, Verney Avenue.

Ilford.—Large store, Cranbrook Road and Ley Street, for Brador Estates, Ltd.; Pauling Construction Co., Ltd., 26, Victoria Street, London, S.W.1.

Kent.—Ambulance stations at Maidstone and Southborough; E. T. Ashley Smith, county architect, Springfield, Maidstone.

Kington.—Houses (46), Crooked Well site; Selleck, Nicholls & Co., Ltd., East Hill, St. Austell.

Leicester.—Old people's home (£62,370), near Narborough Road, and 81 houses, Eyres Monsell estate (£102,000); city architect.

Liverpool.—Operating theatre block and lecture hall at Liverpool Royal Infirmary (£100,000); secretary, United Liverpool Hospitals Board of Governors, 80, Rodney Street, Liverpool, 1.

Loftus.—Houses (52) and bungalows (22), Easington estate; C. D. Taylor, U.D.C. architect, 41, Baxtergate, Whitby.

London.—Office block, Oat Lane, E.C.; Trollope & Colls, Ltd., 1, Noble Street, E.C.2.

Shops and flats, Kensington Church Street; White Bros., Ltd., 257a, Fort Road, S.E.1.

Out-patients', casualty and dispensary departments, Putney Hospital; Truett & Steel, Ltd., builders, 71, High Street, Thornton Heath.

Longbenton (Northumberland). — R.C. school (£119,000); R. Burke, architect, Lambton House, Jesmond, Newcastle-on-Tyne.

Luton.—Extensions to Maternity Hospital (£45,000); North West Metropolitan Hospital Board, 40, Eastbourne Terrace, London, W.2.

Macclesfield.—Second phase of scheme for extensions to county high school for girls (£49,620); J. G. Kellett, director of education, City Road, Chester.

Manchester.—Eight-storey office block, York Street; Williams Deacon's Bank, Ltd., Mosley Street.

Middlesbrough.—New Brackenhoe Secondary School (£155,000); J. Miller & Partners, contractors, Wakefield.

Newton Aycliffe.—Houses (204); chief architect, Aycliffe Development Corporation.

Peterborough.—Fourteen blocks of flats, Derwent Drive and Waveney Grove, Gunthorpe; city architect.

Seaton Valley (Northumberland).—Houses (70), Westbourne estate; John Twiname, Ltd., builders, Brigham.

Shrewsbury.—Houses (113), Harlescott Grange estate; S. R. H. Loxton, town clerk, Guildhall.

Smethwick.—Office block, Church Hill; Walford & Maddocks, Ltd., builders, Tyburn Road, Erdington, Birmingham.

Stanley (Co. Durham).—Civic hall; P. L. Browne, Son & Harding, architects, Pearl Buildings, Newcastle-on-Tyne.

Stevenage.—Houses (64), Fishers Green Road estate; surveyor, 19, Orchard Road, Stevenage, Herts.

Tottenham.—Houses (212), garages, stores, etc., White Hart Lane Development; M. Lindsay Taylor, town clerk, Town Hall, N.15.

Wisbech.—Medical ward unit and out-patients' department, North Cambridgeshire Hospital; Ward & Woolnough, architects, 8, South Brink.